Telephone Engineer

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No Harm Done by Legislators

Members of the United States Congress and most of the state legislators have adjourned and returned to their homes without taking steps which would seriously injure the telephone industry. Doubtless every manager and investor in public utilities drew a sigh of relief, on discovering that all was well for the present, after having been given some unpleasant moments by the seemingly willful or misguided assault on public utilities.

Those who caused this apprehension throughout the telephone industry and other utilities, doubtless failed to realize that their targets were industries in which not only has public money been invested, but industries on which the public must depend for its most important conveniences of present day living, and that as public servants themselves in the capacity of national and state legislators, it was their duty to protect, and not attack, these utilities.

Doubtless some of the difficulty was caused by self-glorifying demagogues, who desired only to attract attention to themselves; perhaps some was occasioned by untactful public utility relations with the public; and considerable of the trouble can be laid to unfavorable industrial and trade conditions which have precipitated the depressed financial world.

Legislative meddling with any business which politicians may consider an advantageous vote-making prospect, is no new maneuver by those who would tear down any other man's house in order to build one of their own. Neither is there anything novel to legislative observers in the display of personal grievances or personal greed.

It is the old, old story of little or designing men, clothed with brief legislative authority, assuming to set themselves up as dictators of affairs with which they have had no experience; or of men with business ambitions with axes to grind as a discredit to any interests they may deem inimical to their own full sweep of autocratic success.

But whatever the cause of the ever-prevailing legislative threat against public utilities, there are usually sufficient fair-minded and unselfish legislators on guard to prevent injustice and destruction. To these men the utilities owe a gratitude which can be repaid only by dealing fairly with the public. Public utility managers who resort to shrewd manipulation and cunning devices under the classification of "smart financing" may be the cause of serious embarrassment for the just as well as the unjust. As long as public utility heads continue to exercise a proper regard for the rights of the public, and conduct their affairs on a four square basis, there is no serious danger from adverse legislation. This is the only safe and sure business and public confidence building course to pursue.

One bank defaulter can spread disaster to a wide range of honestly conducted and sound institutions in his locality; one quack can bring a scandal upon the medical profession in a large area; one hypocrite in the ministry can bring far-reaching reproach upon the religious cause; and one drop of impurity will contaminate a well full of pure water.

And so let us discourage irregularities and deceit in the telephone business. The more square shooters we have in the business, the safer we will be from the demagogue and the destroyer.

Measuring Power and Voltage

When a power company sells electricity it delivers current to the house through the medium of wires, at a definite, specified voltage.

Everyone from the general manager of the power company down to the office boy knows what voltage is supplied to the premises of their customers.

But what of a telephone company? When it contracts to furnish service, what is promised for delivery to the subscriber's telephone receiver in the way of voltage, power level, or definite quantity of the distant applied voice wave?

Although power and telephone service are not entirely comparable, there is considerable truth in the suggestion that the average telephone man

knows too little about the quantitative value of the commodity which he dispenses. What is the voltage which goes over his wires? What is the power level? What is the overall loss expressed in db? The answers to these questions do not involve a medley of complex mathematical equations; neither do they require a laboratory for solution. They can be answered by any practical telephone man with the assistance of relatively inexpensive testing and measuring equipment.

The theory, measuring equipment, and method of making quantitative transmission tests are discussed in this issue of TELEPHONE ENGINEER on the Vacuum Tube page. Every one interested in this subject is urged to read this month's Vacuum Tube Theory and Practice article as well as the ensuing articles on this subject which will follow in the next few issues.

Depression as Viewed from Abroad

From England comes a bit of sound advice and good cheer to America. The following message, which is from Herbert N. Casson, editor of Efficiency Magazine of London, was read at the recent state utilities convention in Oklahoma City, Okla.

"Here is the thought that I would like to send out to the business men of America.

"You are depressed. You think you are crippled. You are afraid of the future. You are full of fears. You have half the gold of the world and half of the machinery and most of the automobiles and all the skyscrapers. You have the greatest home market in the world and the largest corporations that the world has ever seen. You are ruled more by ideas and less by tradition than any other people in the world. You have usually done what you thought you could do.

"How can it be possible that a progressive nation of 120,000,000 people can be wrecked by the speculations of a little handful of fools in Wall Street? The prices that were forced too high had to come down. Today all the prices are too low. There is now a golden opportunity for every man who has eyes to see it.

"Frick started his career by buying coke ovens in the slump of 1873. Carnegie made $300,000,000 by buying steel plants in slumps. Hundreds of fortunes have been made by buying from pessimists. Ye gods! What a chance there is at the moment. In five years from now most American business men will belong to the 'I Wish-I-Had Club.'

"When a horse balks the balk is in his head, not in his legs. He moves on when he thinks he will. And when an American business man is depressed, the slump is in his head. There is nothing serious to prevent him from making money if he thinks he will. When fear rules the will nothing can be done, but when a man casts fear out of his mind the world becomes his oyster. To lose a bit of money is nothing, but to lose hope—to lose nerve and ambition—that is what makes men cripples.

"This silly depression has gone on long enough. Get rid of it. It is inside of you."

Our Engineering and Management Course

The Theory of Power Ringing Equipment Is Discussed in This Fourth Chapter of a Course of Practical Technical Instruction Prepared for Telephone Engineer by B. C. Burden, Transmission Engineer, Lincoln Telephone and Telegraph Company

General

This article discusses the theory of the different types of power ringing machines.

The phrase "power ringing machine" as used in the telephone field refers to machines which convert either direct current or commercial 60 cycle alternating current to current suitable for ringing telephone bells. Such machines are often referred to as "converters."

All telephone offices except those of less than a hundred lines can generally justify a power ringing machine, as hand ringing is very tiresome and slows up operating, and cannot be relied on to give a uniform ring.

Types of Ringing Machines

There are five basic types of power ringing machines, viz:

(1) The motor-generator type;
(2) The D. C. commutator type;
(3) The pole changer type (D. C. operated);
(4) The A. C. vibrating reed type.

Motor Generator Type Ringing Machines

Of the five types of ringing machines the motor-generator is the simplest. It consists merely of a motor-driven generator. The motor is operated from either commercial alternating current or from the central office storage battery (common battery offices). The generator is usually of the permanent magnet field revolving armature type.

In the metropolitan offices motor generator sets are used, but these units differ from those suitable for the smaller exchanges in that the field is of the electromagnetic and not of the permanent magnet type.

Figure 1 shows a popular make of motor-generator type ringing machine.

The driving motors can be obtained for operation on either 110 or 220 volt 60 cycle supply, but 110 volt supply is more generally used.

The frequency and voltage of the ringing output depends on the speed of the driving motor. An A. C. motor of constant speed characteristics is used so that no trouble is encountered from speed variations.

The output frequency and voltage are usually designed to be 80 to 90 volts at 16 to 20 cycles.

"Magneto type" ringing machines can be obtained for loads up to 1,500 subscribers.

The operating costs of this type of generator are somewhat higher than other types of ringing machines, however its performance leaves little to be desired and in most cases more than justifies the higher operating costs.

Motor generator type ringing machines but seldom cause interference to nearby radio receiving sets and when they do it can be readily corrected by cleaning the commutator and brushes.

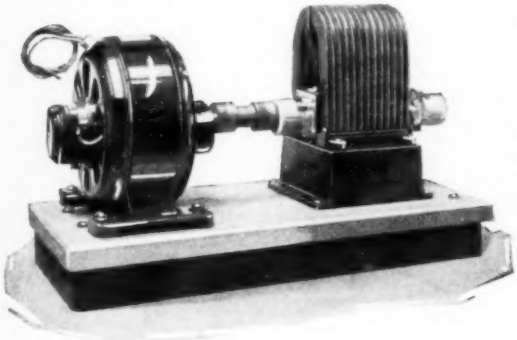


Fig. 1—Motor generator type ringing machine

D. C. Commutator Type Ringing Machines

Another type of motor-driven ringing machine is the direct current commutator type. These machines are suitable chiefly for common battery exchanges. This machine is said to be no longer on the market.

They consist of a direct current motor operated from the central office storage battery, a revolving commutator attached to the motor armature shaft, and a transformer.

Ringing current is obtained by the action of the commutator which reverses the direct current flowing through the primary of a transformer so that alternating current of the desired frequency is obtained on the secondary side of the transformer.

Figure 2 shows the schematic circuit of the Butler-Lane ringing machine which is typical of this type machine.

It will be noted from the diagram that an ordinary shunt D. C. motor is used, and that the plus and negative lead of the central office battery is connected to the primary of the transformer through the retard coil and reversing commutator. The reversing action will be made plain by referring to the diagram showing the commutator as having revolved one-half turn from the initial position shown.

The purpose of the retard coil is to prevent the reversing commutator from introducing noise into the central office battery. One cycle of alternating current is produced by each complete revolution of the commutator. Inasmuch as the motor is designed to run at 1,100 revolutions per minute, the output frequency would be approximately 18 cycles per second.

The voltage step-up ratio of the transformer is such that the 24 volt current pulsed through the primary winding is stepped up to approximately 90 volts.

This type of ringing machine is suitable for common battery offices only. They have one advantage over A. C. type machines in that they do not depend on commercial power sources, and are, therefore, not affected by interruption to the power service.

The Leich A. C. Vibrating Reed Type

One of the common types of ringing machines found in the smaller telephone offices is the type which rectifies the commercial 60 cycle power current and then pulses this current by means of a vibrating pendulum or reed to obtain the desired frequency.

In recent years considerable improvement has been made in this type of machine. The improvements have resulted primarily from the necessity of modifying the rectifying method so that interference to nearby radio sets would be eliminated.

Figure 3 shows the circuit schematic of one of the older types of vibrating reed machines designed to convert 60 cycle 110 volt current to 20 cycle ringing current.

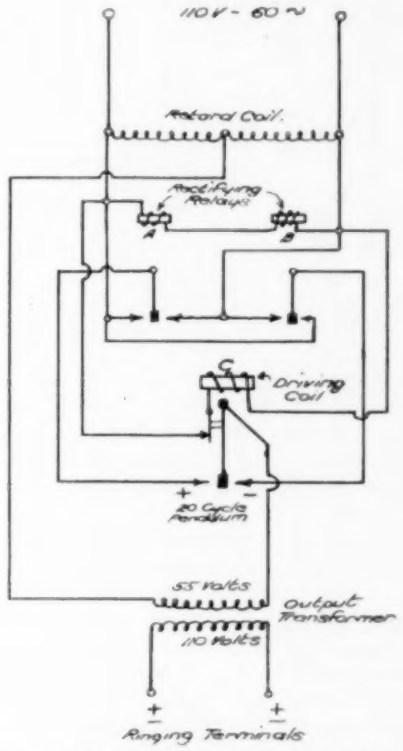


Fig. 3—Schematic circuit of Leich ringing machine (old type)

This machine operates as follows: Two vibrating polarized relays, A and B, are connected directly across the 110 volt 60 cycle circuit and vibrate in synchronism with the 60 cycle current. These relays are so connected that the armatures move in the same direction, and as they reverse their movement with the reversal in current flow in the supply line the resulting current flowing outward through the vibrating reeds is always in the same direction.

The action of the two vibrators therefore produces a direct current of a given voltage which is pulsed through a transformer by means of the vibrating reed or pendulum, C, which is driven by an electro-magnetic coil as shown. This action is equivalent to applying an alternating current voltage to the transformer. The transformer being of the "step-up" variety raises this voltage to approximately 100 volts on the secondary or ringing side. The frequency of the ringing current is proportional to the speed of the reed, C, increasing as the speed of the reed increases. The speed of the reed is regulated by an adjustable weight at the lower end of the pendulum.

For the ringing of ordinary polarized

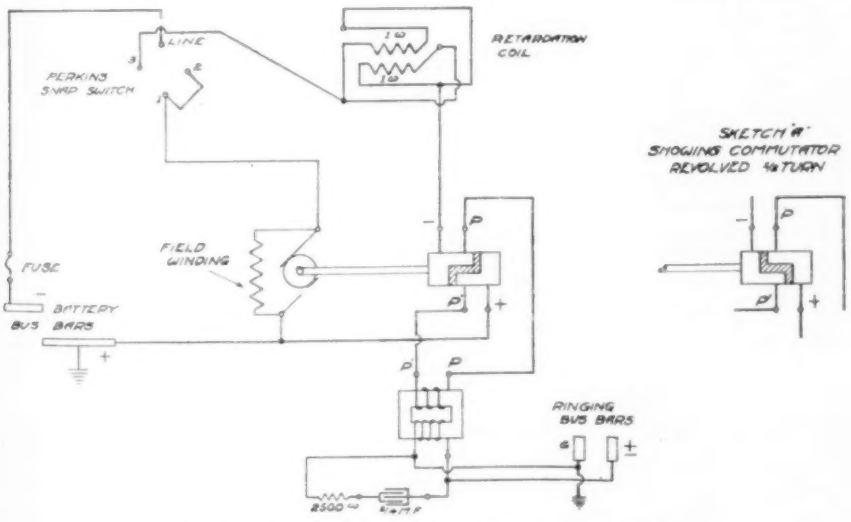


Fig. 2—Schematic of Butler-Lane ringing machine

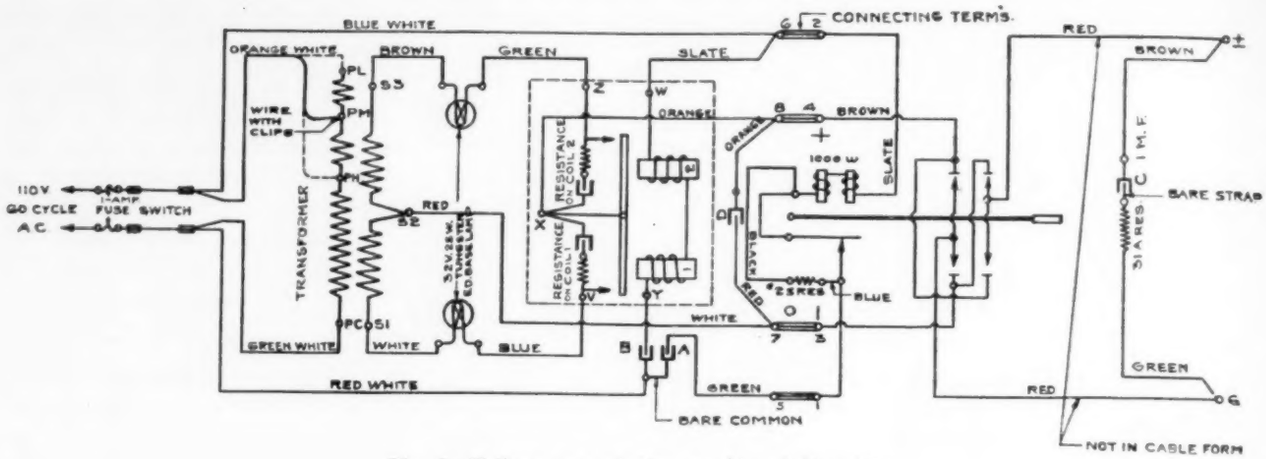


Fig. 4—Kellogg type ringing machine (old type)

ringers 20 cycles is the usual operating frequency.

Summarizing the action of this type of ringing machine we could say that it converts the 60 cycle A. C. input to D. C. by means of *two* vibrating polarized relays, and then pulses the rectified D. C. through a transformer to produce the desired ringing frequency and voltage.

There are several disadvantages with this type of machine, viz: The sparking of the rectifier contacts produce very severe interference to nearby radio sets; the wave form is such that considerable "noise" is induced in the keyboard wiring by induction (this noise is particularly noticeable on the operator's circuit), and the rectifying action of the vibrating relays is not as perfect nor satisfactory as other rectifying methods. (Note: These objections have been eliminated by the newer models of this make of ringing machine.)

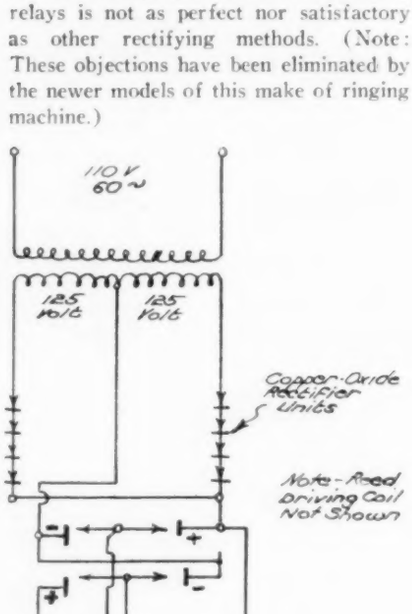


Fig. 5—Schematic copper-oxide type ringing machine

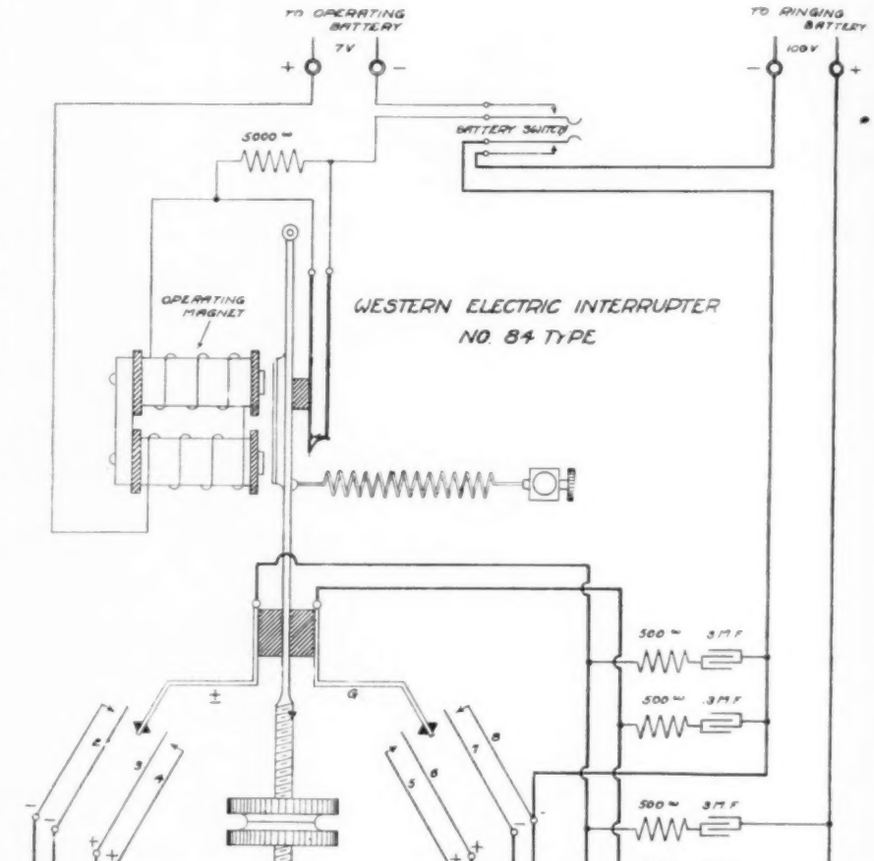


Fig. 7—Schematic of Western Electric 84 type ringing machine

The Kellogg Type Ringing Machine

Another make of machine of the A. C. vibrating type, of which many are in service, is the Kellogg Nos. 3, 4, 6 and 7 converter.

The basic circuit for this machine is shown in Figure 4. It differs from the Leich machine in that only one rectifying relay is used and additional contacts are used on the vibrating pendulum. It

will be noted that the voltage is stepped up before rectification instead of afterward, as was the case with the Leich machine.

The operation of the Kellogg machine is as follows:

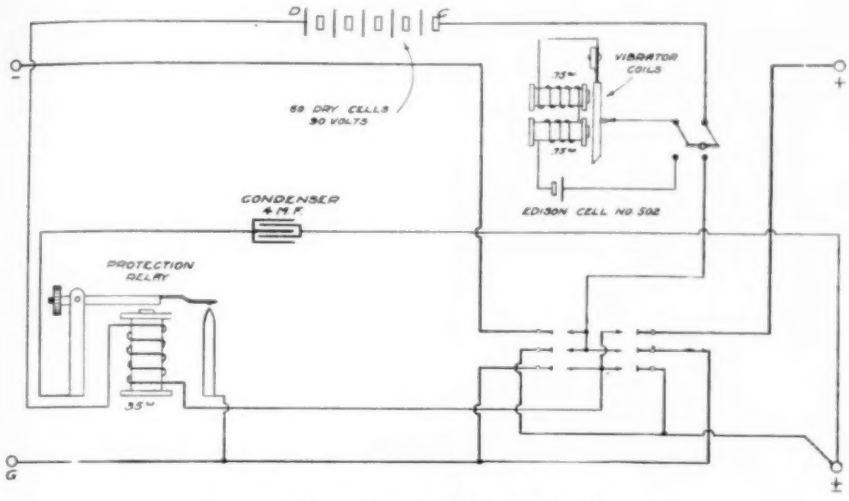


Fig. 8—Schematic of a Warner pole changer

The 110 volt 60 cycle supply voltage is stepped up to approximately 220 volts by the transformer. The rectifying relay, "A," vibrates in synchronism with the 60 cycle source, being connected directly across the secondary terminals. This results in a D. C. potential of one-half of the total secondary voltage between terminals X_1 and X_2.

This rectified D. C. potential is connected to the terminals of pendulum, "B," which vibrates at the desired ringing frequency. The vibrating pendulum merely serves as a reversing switch connecting the rectified D. C., first in one direction then in the opposite direction to the ringing leads.

It will be noted that a resistance in series with a condenser is connected across the vibrating rectifier and pulsating reed contacts. This is necessary to reduce sparking at these contacts.

Copper Oxide Vibrating Reed Type A. C. Ringing Machines

Because of the several disadvantages of A. C. ringing converters using vibrating relays as rectifiers, some of the manufacturers have brought out new models the last few years in which the relays have been replaced with copper oxide rectifiers, the pulsing arrangement remaining substantially the same.

Figure 5 represents the schematic of this type of machine. The copper oxide rectifier consists of a copper disc held against a similar sized disc of copper oxide. Such an arrangement will pass current in one direction only. A number of discs in series must be used in order to withstand the voltage used.

ment by replacement of the rectifying relays with copper oxide units and changing the transformers.

This type of converter is quiet in operation both from a radio interference and keyboard noise standpoint, and causes little or no maintenance trouble.

Existing machines of the old type can be converted to the copper oxide arrange-

The Pole Changer Type

Most of the early ringing converters were known as pole changers and were operated from dry batteries.

One of the best known is the Western Electric's 84 type, the circuit of which is shown in Figure 7. The Warner pole changer, shown in Figure 8, was also very popular in the early days. The pole changer consists essentially of a vibrating reed having contacts which reverse the polarity of a D. C. source (either dry cells or storage battery),

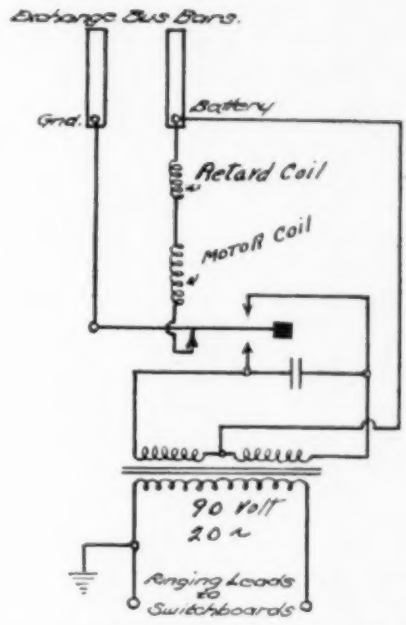


Fig. 9—Schematic of Kellogg No. 36-A single frequency type pole changer

either through the primary of a transformer or directly to the ringing bus bars.

Some years ago it was the practice to operate these pole changers from dry cells, and while there are undoubtedly many exchanges still following this practice, in most cases storage batteries have replaced the dry cells.

Pole changers, or converters as they are more commonly known, are used to obtain the several frequencies used in harmonic ringing systems. Figure 9 shows the schematic of the Kellogg No. 36-A single frequency pole changer which is very similar to the Western Electric 84 type interrupter in its operation.

(Continued on next page.)

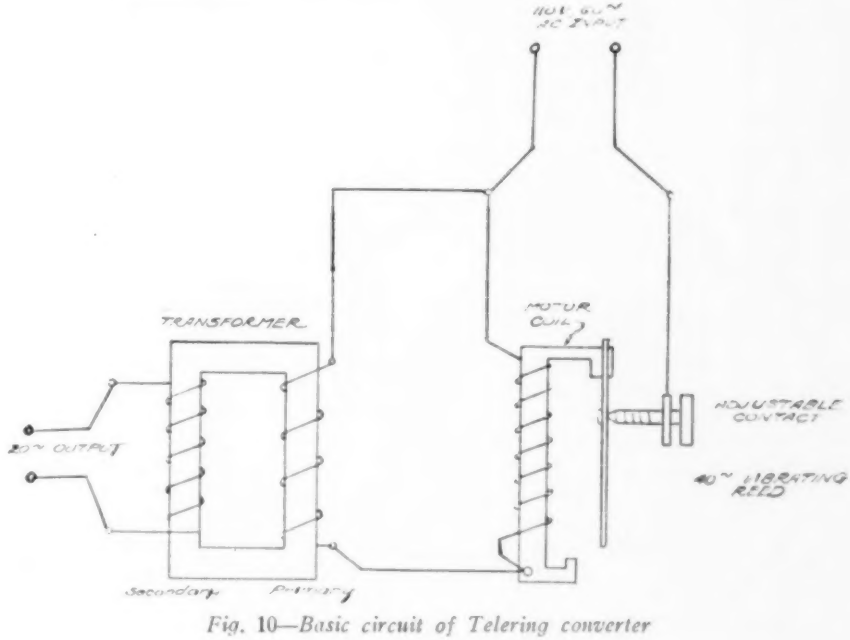


Fig. 10—Basic circuit of Telering converter

Pole changers of the type shown in Figure 8 are no longer manufactured.

The Telering Ringing Machine

Another basic type of ringing machine is the Telering.

This machine, which was first placed on the market only a few years ago, has in a short time become very popular, especially with the small and medium sized telephone companies.

The outstanding features of the Telering is its extreme simplicity, low first cost, and low maintenance.

The principle of operation of the Telering is entirely different than any of the vibrating reed type machines already described.

Figure 10 shows the schematic circuit of the Telering. All features not concerned directly with the fundamental operation have been omitted from this diagram in order to make it easier for the reader to grasp the theory of operation of this machine.

It will be noted that the Telering consists essentially of a tuned 40 cycle reed, and an output transformer.

The operation is as follows: Referring to Figure 10 it will be seen that when the reed contact is closed that current from the supply line will flow through the primary of the transformer as well as the driving coil of the tuned reed.

When the supply circuit switch is closed, the reed contact being closed, current flows through the motor coil and the reed is attracted to the pole piece which opens the contact and the current flowing through the coil is cut off and the reed swings back to its normal position again, closing the contact. The contact, being common to both the primary of the transformer and the motor coil, each time the contact is closed an impulse is also sent through the primary of the transformer.

The reed is mechanically arranged so that only every third alternation of the 60 cycle input is impressed on the primary of the transformer and the motor coil.

How this is accomplished can be seen by reference to Figure 11 which shows the duration of the open and closed period of the tuned reed.

It will be noted that the reed, being of very thin flexible steel, will not stop in its movement toward the pole piece of the motor coil the instant the contact is opened. But due to its momentum it will swing an appreciable part of an arc before the resulting tension will cause it to swing back toward the adjustable contact. However, when the contact again closes, the inertia of the reed movement will cause it to flex at the point of contact, and the lower portion of the reed will swing past its normal position when at rest. The contact again being closed the current flowing through the motor coil will cause the reed to swing back towards the pole pieces and the cycle will again be repeated.

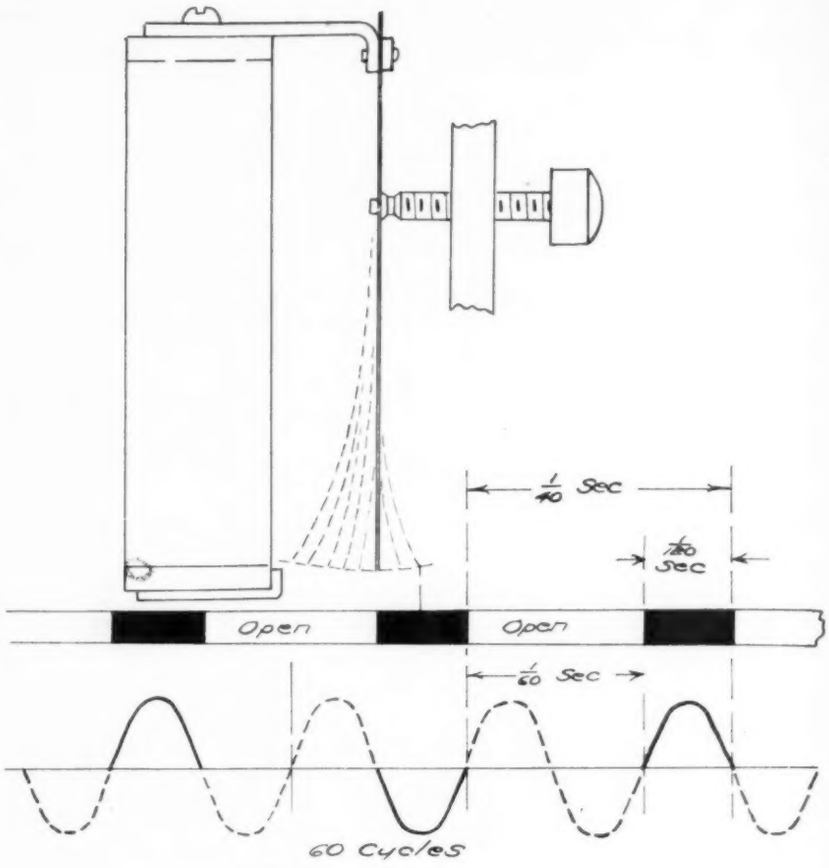


Fig. 11—Action of tuned reed

Referring to Figure 11 it will be noted that effect of the flexing of the spring due to inertia causes the contacts to be open for 1/60th of a second and closed for 1/120th of a second. The fact that the reed is flexed at its suspension point in one case and at the contact point in the other accounts for the difference in the time the contact is closed or opened.

The length of time required to complete a full cycle of reed operation is 1/40th of a second which accounts for the reason for using a 40 cycle tuned reed.

The effect of the opening and closing of the contact is to impress only every third half cycle of the 60 cycle wave on the primary of the transformer. The output wave of the secondary would look like Figure 12 and not like Figure 13 which is a true 20 cycle wave.

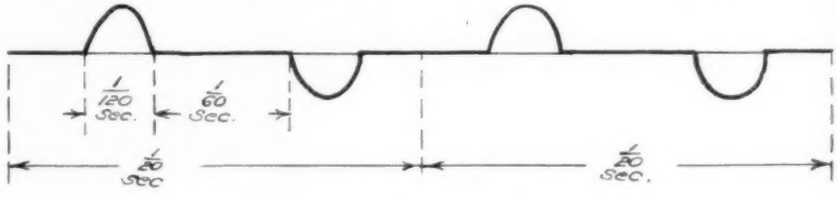


Fig. 12—Telering output wave

The output wave of the Telering consists, then, of a series of positive and negative half-cycles having a wave form identical to that of the 60 cycle input

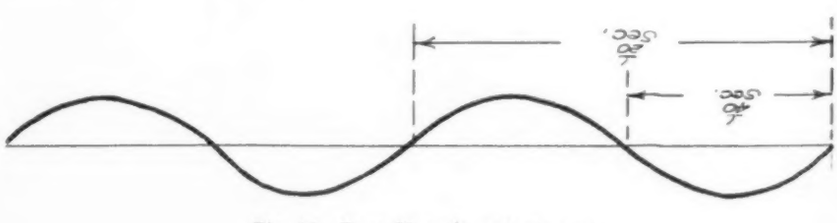


Fig. 13—True 20-cycle output wave

source but with a no voltage time interval of 1/60th of a second occurring between successive half-cycles.

Such a wave has been proven equally as efficient as a true 20 cycle wave, and in certain respects is thought to be better.

The adjustment of the Telering is very simple and consists of merely backing the adjustable contact off until the reed stops vibrating and then turning it back in until the contacts just meet, at which point the reed will be self-starting and should vibrate evenly without any sparking at the contact.

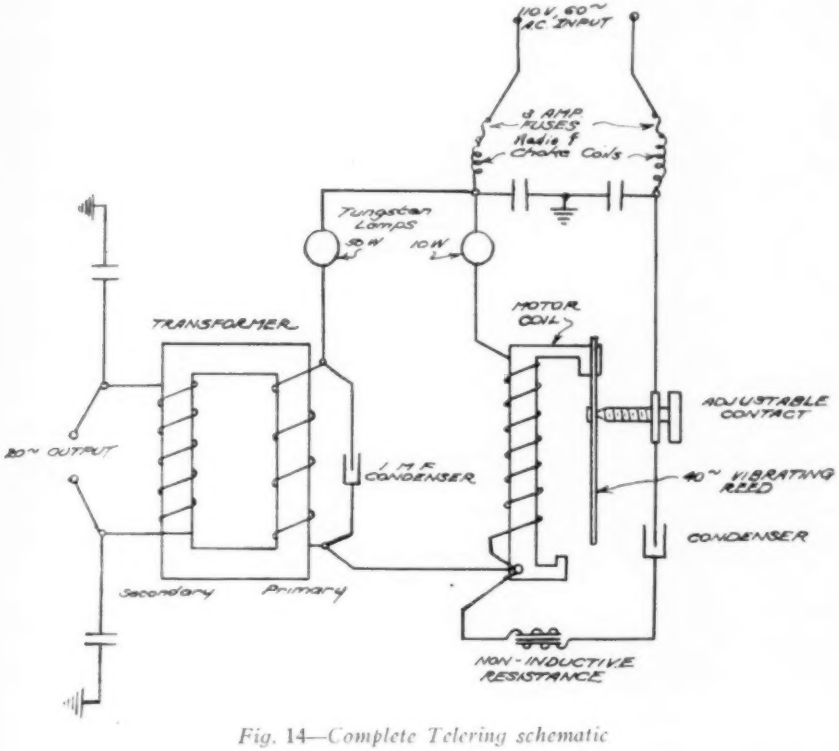


Fig. 14—Complete Telering schematic

Figure 14 shows the complete Telering circuit. This circuit shows the spark-absorbing circuit, the radio interference chokes, and the resistance lamps.

Miscellaneous Notes

Though not previously mentioned, resistance lamps are usually placed in series with one of the ringing machine output leads to prevent series overload in case of ringing in a short circuit or low resistance line.

But little trouble is experienced with present-day ringing machines, for, in the first place, they are not as inherently "noisy" as older types of machines, and in addition most machines are furnished with radio frequency noise suppression apparatus wired into the circuit.

This usually takes the form of R. F. choke coils in series with leads feeding sparking contacts, and condensers shunted across the contacts or across coils likely to cause trouble. As an additional precaution some manufacturers place their machines in steel cabinets which are connected to the C. O. ground.

Every telephone man responsible for the maintenance of ringing machines should familiarize himself with the theory and adjustment of the machine which he maintains, as good clear ringing cannot be obtained with a machine poorly maintained.

CONVENTION SCHEDULE

Up-State Telephone Association, Rochester, N. Y., May 20, 21, Seneca Hotel.

Pennsylvania State Telephone & Traffic Association, Hotel Penn Harris, Harrisburg, May 26, 27 and 28.

Kansas Telephone Association, Abilene, June 2, 3, 4, The Sunflower Hotel.

WELCH TELEPHONE SYSTEM IS MODERNIZED BY OWNER

An improvement program started here by the Welch-Bluejacket Telephone Company, Welch, Okla., more than two years ago was completed recently with the removal of all telephone poles from the streets and parkings and placing of new poles and underground cable lines in alleys. After the Business Men's Club of Welch had agreed to permit an increase of 25 cents per month in telephone rates, E. E. Noe, owner and manager, carried out an extensive improvement program in which the entire exchange was rebuilt, giving this city one of the best telephone exchanges, for a town of its size, to be found in the southwest.

NEW SINGAPORE LINK MARKS IMPORTANT STEP IN MALAY

Telephone service between Kuala Lumpur and Singapore will be opened about July 1, 1931, according to the Singapore Free Press. It is also reported that service between Singapore and Ipoh, via Kuala Lumpur, will be ready by about the same date and service from Singapore to Penang will be ready before the end of this year. On completion of the Singapore-Penang service, the whole of the Federated Malay States telephone system will be connected with Singapore with the exception of Pokan and Kuantan, which are not connected with the main Federated Malay States system. Unimportant as the Singapore-Kuala Lumpur link may seem compared to a Batavia-New York conversation, it represents an important forward step in Malayan telephone history, according to Assistant Trade Commissioner Warren S. Lockwood, of Singapore.

I. T. & T. BUYS ROUMANIAN TELEPHONE LINES

A site in the heart of Bucharest, capital city of Roumania, has been purchased by the International Telephone & Telegraph company, and workers for the organization have started construction of a building to house the headquarters for the Roumanian National Telephone Company. Roumanian telephone lines recently were purchased by the International Telephone & Telegraph company from that government for $4,500,000.

Scores of complaints recently sent telephone linemen to a certain district in Seattle, Wash., from which numerous complaints had been received to the effect that telephone lines were dead. A search revealed that woodpeckers had bored through a terminal box and short-circuited the lines. Previous study had revealed that woodpeckers preferred boxes painted green and would not disturb those painted white. But when the white paint begins to wear off or becomes dull, the birds again go to work.

Four telephone systems operated by subsidiaries of the Western Power, Light & Telephone company are in the process of being rebuilt and modernized. The points affected are Ness City, Kans., Watonga, Okla., Taft, Mex., and Weslaco, Tex.

New cables are being installed to care for the increasing traffic on telephone lines in Morristown, Dover, Boonton and Rockaway, N. J. Increasing use of telephones to call neighboring towns has created a need for new facilities, according to R. K. Totten, manager for the New Jersey Bell Telephone company.

Operation of Reverting Busy Tone Feature

This Element in the Telephone Which Is Incorporated in the Straightforward Trunking System at the Incoming End of the Trunk Is Described by John H. Levis, Jr., Telephone Engineer, Rochester, N. Y., in the Eleventh of His Series of Articles Prepared for Telephone Engineer

Reverting Busy Tone Feature

The feature about to be described is known as the "reverting busy tone." It is incorporated in the straightforward trunking system at the incoming or "B" end of the trunk, and the tone can be applied to any "B" trunk in the position by means of two common reverting tone keys. These keys are in a multiple connection and are situated on the keyshelf, one on the right end and the other on the left end. They are separated from the common ringing keys so that they cannot be operated accidentally when any one of the ringing keys is operated.

A call for a distant office originates in the usual way, as shown in the diagram. The calling telephone, calling line and the "A" cord circuit is used for answering the call. The associated relays and lamp function. The front cord of the cord circuit is placed into an idle outgoing trunk circuit and the battery and ground from relay "A" of the cord circuit causes the number one relay of the trunk circuit proper to operate, which in turn operates the number three relay causing the "B" operator to cut in on the circuit, resulting in a call passing tone and flashing trunk lamp. All of these features have been pescribed in previous issues of TELEPHONE ENGINEER.

The "A" operator passes the called for line number to the "B" operator and the "B" operator takes the trunk plug of the trunk (the lamp flashes on) and proceeds to make a busy test of the line called for. In this case she finds it in a busy condition by touching the tip of the plug against the sleeve of jack of the line, which causes a click in her headset. This feature also has been described in a previous issue of TELEPHONE ENGINEER.

The next operation on the part of the "B" operator is to revert a busy tone to the calling station, which can be done in two ways, one of which is by making a pre-selection, that is, as soon as the "B" operator receives the called for line number and party line suffix the proper common party ringing start key is operated. This operation is actually completed before the operator tests the called for line. This pre-selects the proper ringing frequency called for on the trunk and at the same time allows another call to come in to her headset. The flashing lamp goes steady and all of the previous relay operations of both trunk circuit proper and commons involved in this incoming call are released.

The number nine relay and several other relays of the trunk proper are operated but the number nine relay is the one involved in the circuit that closes the operating path for the number 12 or busy tone control relay. It will be noted in the diagram that the number 12 relay has battery on its winding and the other side of the winding goes to the contact of the make before break construction, then to the make contact of the number nine relay which is operated through the back contact of number 11 non-operated relay, number 29 common relay (not shown; see complete diagram in October, 1930, issue of TELEPHONE ENGINEER) and through the back contact of the number six common relay (common reverting tone key relay) to the high resistance winding of the number seven common relay to ground. These operations close a circuit for operation of the number seven relay only, as the ohmic resistance of the number seven relay is high so as not to allow the number 12 relay of the trunk to operate. With the number seven relay operated it will be noted that the locking winding of the relay is closed by its own contact to a double make contact of the number six relay and is connected to the first to make contact of the number six relay.

The first to make contact places ground to the locking winding of the number seven relay which is connected to battery. This holds relay number seven operated. The second contact of the double make also places ground across the high resistance winding of the number seven relay through its own contact, thus shorting out the relay and giving practically zero ground resistance to the number 12 busy tone relay in the trunk, causing it to operate. The number 12 relay is then locked up on its own winding to ground at the number three relay in the trunk, which is operated from the number one relay.

The starting wire for the number 12 relay is now opened, otherwise the ground from the relay would return on the originating path to the number seven common relay and maintain a zero resistance ground on the common lead and cause all trunks to take a busy tone when pre-selected.

All of the above operations take place when either one of the common busy tone keys is operated. When busy tone key is operated a preventive to keep the busy condition from being set up on the circuit on which there has just been made a pre-selection must be provided. The busy tone should only be set on the circuit previously pre-selected, or in other words on one trunk at a time. Of course, if more than one trunk is ready to be plugged up into line jacks and a busy tone key is operated, these trunks will take the busy tone, but this condition is not the usual one. The usual condition is to have not more than one trunk ahead of a trunk which is ready to be plugged up, because the "B" operator has two called for numbers to take care of and this is about all that can be handled with accuracy.

The trunk lamp on the trunk that is placed on the busy tone goes out which indicates to the "B" operator that no further work on this trunk is necessary. The tone stays on the trunk until the "A" cord circuit is removed from the outgoing end of the trunk. This operation takes place when the calling party hangs up the receiver. Both supervisory lamps of the "A" cord circuit are lighted, which indicates to the "A" operator to take down the plugs.

The busy tone relay number 12 releases at this time which is caused by the releasing of number one and number three relays. The trunk circuit is again ready for trunk switching service.

It will be noted on the circuit diagram that if the trunk plug is placed in a line jack the number eight relay operates causing the number 11 relay to operate which opens the operating path for the number nine relay and the operating path to the number 12 busy tone relay. This is done so that when a plug is in a jack and the busy tone key is operated, no tone will be placed on the trunk.

The operation of the part of the circuit of the number seven common relay that prevents the trunk circuit that is cut in from taking a busy tone when a busy tone key is operated is described as follows:

The operating path for the number nine trunk relay, through the number 11 trunk relay and through the number five relay to the common number 11 relay and to the back contact of the break make contact of the number seven common relay, which is open, cannot get a ground circuit from the busy tone relay number six when it is operated from a busy tone key. The number six relay in the commons is a slow release type relay and holds long enough after a tone key is

released to maintain a ground to the number 12 busy tone relay of the trunk so that accurate operation of same is attained.

The second method of applying the busy tone to a trunk follows: The "B" operator receives a number over the trunk in the usual way and does not pre-select the ringing because she knows that the line called for was just placed in service on a previous order and knows that it requires no testing. She proceeds at once to operate a busy tone key to place the busy tone on the trunk. The number seven relay does not operate because the number nine relay of the trunk circuit does not operate, as in the case of a pre-select, but when the number six common relay is operated, ground from the double make contact first makes contact through the back contact of the number seven relay, the number 11 common, the number five trunk relay, the contact of the number 11 trunk relay to the number nine relay, operating the relay and closing the circuit to the number 12 busy tone relay. The second ground of the double make contact of number six relay then is placed on the common to the number 12 relay in trunk operating it. This operation of the busy tone key under the above condition also releases the operator from the connection, stops the flashing lamp and makes it dark as in the first method. The operator is then cut in on another incoming call in the usual method.

The busy tone from the power circuit is not cut in to the busy tone commons on the number 12 relays until one of them is actually operated. This is done so that the tone may be kept out of the cable forms until it is actually required, eliminating any possible disturbance. The method of applying the tone is as follows: When the number 12 relay operates, two make contacts close, closing a circuit from both tip and ring of the trunk repeating coil to the busy tone circuit. The ring side of the circuit has the number 32 common relay of high ohmic resistance connected to it. With ground on one side of its windings and the other side connected to the battery winding of the number two relay in the trunk circuit, the number 32 relay operates. The number two relay does not operate.

When relay number 32 operates a circuit is closed to the common office 120 I. P. M. interrupter, with ground interruptions to the number 33 common relay. The battery on the winding of relay number 33 causes it to be interrupted. This relay has two make contacts, on one side is the tip and ring of the busy commons to number 12 relay and on the other side is the steady dry tone of 350 cycles through two one-microfarad condensers placed in each side of the tone circuit. The condensers are in the circuit so that the number 2 trunk relay will not operate through the secondary windings of the inductor type tone machine. With the number 33 relay being interrupted the usual buzz-buzz sound to the calling station at the "A" office is heard, indicating that the called for line is busy.

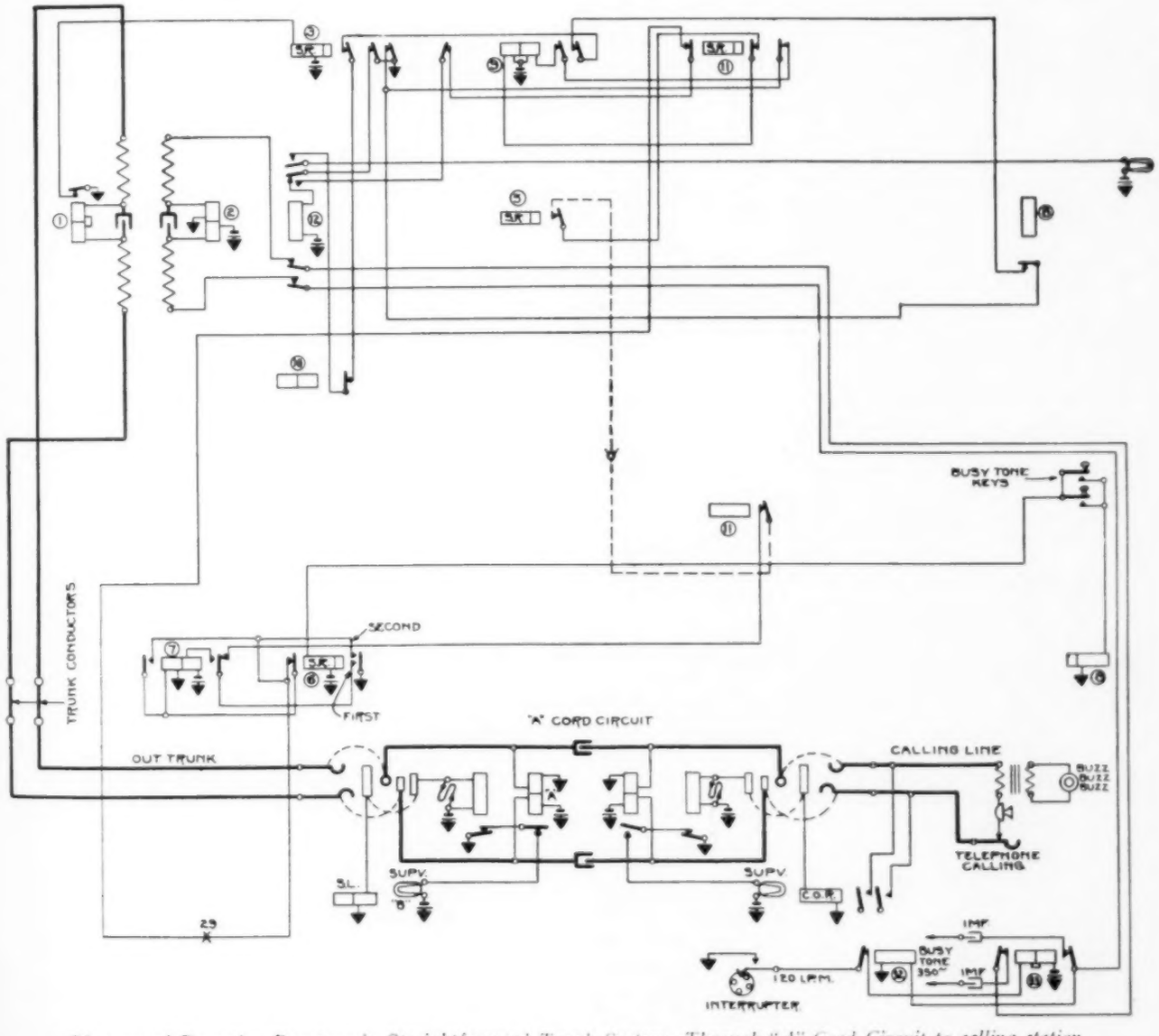


Diagram of Reverting Busytone in Straightforward Trunk System—Through "A" Cord Circuit to calling station.

Elementary Course in Telephone Practice

Current, Pressure and Resistance Are Analyzed and Their Electrical Terms Defined in This Second Installment of a Study of the Telephone Prepared by O. B. Fensholt as a Background of Knowledge for Amateurs and a Review of Important Principles for Experienced Telephone Men

Resistance

We said before that electricity was made up of three things: current, pressure and resistance. We now know:

Amperes is current (electricity in motion).

Volts is pressure (which causes current).

Then we will have to find out something about resistance. The definition in the dictionary for "resistance" is, "Any force tending to hinder motion." Then resistance must be something that hinders or holds back an electric current (amperes), or we might say that we can regulate the amperes by varying the resistance.

We know that we can vary the flow of water by regulating valves, or by using different size pipes. That is, we vary the size of the opening. We know that a large pipe will let more water flow than a small pipe, also that two one-inch pipes in parallel will let more water flow than only one one-inch pipe. That is, the larger the opening, or pipe, or greater number of pipes connected to a tank, the greater the flow or the greater the current.

This same fact holds true when applied to electricity. The larger the wire, or greater number of wires (in parallel) the greater will be the current flow (amperes) of electricity.

Therefore, if we want to regulate the current flow (amperes) to a small amount, we will use a smaller wire. We then know we can vary an electric current by the size of wire.

We can also vary the current of water by the length of a pipe. We said before that if you lived near the pumping station the pressure would be greater than at a further point. Change in pressure will also lessen your current. Thus the length of the pipe will also change or vary your current.

Now, again, this is true with electricity. The longer the wire, the less your current flow (amperes). We now have two ways of varying current (amperes).

1st—The size of the wire or the number of wires in parallel;

2nd—The length of the wire or the number of wires in series.

In electricity we have another form of resistance, and that is the kind of material. That is, iron, brass, copper, etc., all have a different resistance. In other words, everything is a conductor of electricity. Some things are good conductors and some things are poor conductors. Poor conductors are generally considered as non-conductors. For example, glass, rubber, wood, etc., are poor conductors. What we mean is their resistance is so great that the current passing through is practically nil.

Then we have seen that we have three ways of regulating current by resistance.

Let us arrange them in order:

1st—The size of the wire or the number of wires in parallel;

2nd—The length of the wire, or the number in series;

3rd—The kind of material of which wire is made.

The word resistance is a long word, so let us again manufacture a short word. Let that word be "Ohms." "Ohms" then means a certain amount of resistance in some form that regulates amperes.

Standards have been set up for all measures; for example, we have a picture of a "gallon" as applied to liquid, a "foot" to length, a "pound" to weight, a "minute" to time, etc.

In this method a standard has also been agreed upon for the unit "ohm," which is:

One ohm equals the resistance of a No. 10 copper wire 1,000 ft. long.

Remember: That as the wire gets larger (not wire size number) the ohms get smaller, and as the wire gets smaller the ohms get larger. In other words, they work in opposites.

We now have the three most important words in our electrical problems.

Amperes—The current flow of electricity.

Volts—The pressure which causes the current to flow.

Ohms—The resistance which regulates the current flow.

Let us again assemble our chart, comparing all our electrical terms with water:

Unit	Electricity	Water
Quantity	Coulomb	Gallon
Pressure	Volts	Lbs. per sq. in.
Current	Amperes	Gallons per second
Resistance	Ohms	None

Formulas

Very often a new man or a student is afraid to study a certain book, because in glancing through the book he sees some "formulas" or fractions in letters, and he will make the statement that that book is too technical.

This chapter is written for the benefit of the man who otherwise does not understand how formulas are derived.

If we should start by saying that $\frac{L}{M} = W$, it would mean nothing, as we have not given any of the letters a value, and neither do these letters signify anything

However, should we say that $\frac{6}{3} = 2$, you believe that, because you know that we are saying that six divided by three equals two, or that three will go into six two times.

Now, if we should ask you how you would divide or multiply two and three to equal six, or two and six to equal three, your answers would have to be that two multiplied by three equals six, or $2 \times 3 = 6$, and that six divided by two equals three, or $\frac{6}{2} = 3$.

We then have three sets of figures which we call fractions, using 2, 3 and 6, as follows:

$$\frac{6}{3} = 2$$

$$2 \times 3 = 6$$

$$\frac{6}{2} = 3$$

We will now substitute our figures with letters, that is, let $6 = L$, $3 = M$, and $2 = W$, our three sets of fractions would then look like this:

$$\frac{L^6}{M^3} = W^2$$

$$W^2 \times M^3 = L^6$$

$$\frac{L^6}{W^2} = M^3$$

Now, instead of calling them fractions, we will call them "formulas," when we use letters.

Formulas, therefore, are fractions converted to letters, and are simply proven facts for finding one unknown by knowing the other two.

For example: If we say that $\frac{O}{S} = B$, we will have to give two of the letters a value; so let us assume that $O = 140$ and $S = 35$, then B would have to be found by dividing 140 by 35:

$$\frac{O\ (140)}{S\ (35)} = B$$

or B would equal 4.

Leaving the formula as it was, $\frac{O}{S} = B$, then suppose we had given O and B

values instead; that is, O = 140 and B = 4, then using your formula $\frac{O}{S} = B$, you are saying that $\frac{140}{S} = 4$, or that 140 divided by something equals 4, or you are saying that this something (S) will be equal to the number of times that 4 will go into 140, or you changed your formula around so that you now say $\frac{140}{4} = S$ or $\frac{O}{B} = S$, which will make S equal 35.

Again leaving the formula as it was originally, $\frac{O}{S} = B$, and this time let S and B be given, S = 35 and B = 4. Then using your formula, we are saying $\frac{O}{S} = B$, or $\frac{O}{35} = 4$, or you know that something divided by 35 equals 4. By reversing it, you are saying that 4 times 35 will equal that something or $4 \times 35 = O$, or $B \times S = O$, which will make O = 140. You will notice that you have again changed your formula around to read $B \times S = O$.

Therefore, you have set up three sets of figures or fractions which were:

First, $\frac{140}{35} = 4$.

Then, $\frac{140}{4} = 35$,

and $4 \times 35 = 140$.

If we call these fractions formulas, they would be as follows:

First, $\frac{O}{S} = B$.

Then, $\frac{O}{B} = S$,

and $B \times S = O$.

You can therefore see that formulas must be proven facts.

Ohm's Law

We have now learned some important words of our foreign language, and it practically consists of only three words:

Volts—which means pressure.

Amperes—which means current.

Ohms—which means resistance.

We, of course, also learned one other word, which, however, we will not use very often, and that word is:

Coulombs—which means the quantity of electricity at rest.

We also know how formulas are derived, so then let us take what we know about our three terms and our knowledge of formulas and make rules, whereby we can find the answer to one unknown, if the other two are given.

We know that one ohm resistance is equivalent to 1,000 feet of No. 10 copper wire, then we will say:

"That it will take *one volt* of pressure to force *one ampere* of current through *one ohm* resistance, or through 1,000 feet of No. 10 copper wire or its equivalent," or we might say that Ohm's Law is the amount of electric pressure (volts) that it will take to force a certain amount of current (amperes) through a given amount of resistance (ohms).

Therefore, by simple ratio we are saying that 1 (volt) = 1 (ampere) × 1 (ohm), and changing this ratio into fractions, we would have to say that 1 (ampere) then would equal 1 (volt) divided by 1 (ohm) or that 1 (ohm) would equal 1 (volt) divided by 1 (ampere).

Let us prove these, by examples, and then set up our formulas:

If one volt will force one ampere through one ohm, then we know that if we only wanted to have one-half ampere of current with the same one volt pressure, that we would have to double the resistance, or one volt will force one-half ampere through 2 ohms resistance. You will notice that if we divide the volts by the ohms you will get amperes. ($1 \div 2 = \frac{1}{2}$.)

If we had 10 volts pressure and 2 ohms resistance, we would have a current of 5 amperes. Note again the volts divided by the ohms will give you the amperes. ($10 \div 2 = \frac{10}{2} = 5$.)

Therefore, our first rule will be:

"The current (amperes) is equal to the electrical pressure (volts) divided by the resistance (ohms)."

Briefly, we would say amperes equals the volts divided by ohms, or:

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

Let us now apply our shorthand and use letters in place of words, and use:

A is amperes, V is volts, and O is ohms. Then our formula would be

$$A = \frac{V}{O}$$

Now, perhaps we wish to find the voltage required to force a certain number of amperes through a given number of ohms. We have seen that it takes 10 volts to force 5 amperes through 2 ohms. You will note here, then, that 5 amperes multiplied by 2 ohms equals 10 volts ($5 \times 2 = 10$). Suppose we wish ten times as much current, or fifty amperes, then our voltage would have to be 50 amperes multiplied by 2 ohms or 100 volts ($50 \times 2 = 100$).

Our second rule, then, would be:

The pressure (volts) required would be the current (amperes) multiplied by the resistance (ohms).

Or, briefly, we would say:

Volts = Amperes × Ohms.

Now let us convert that to our shorthand:

$$V = A \times O$$

We have now set up rules to find amperes and volts, but quite often we wish to find the ohms.

We said before that 10 volts will force 5 amperes through 2 ohms. You will note in this case that if you divide the pressure (volts) by the current (amperes) your answer will be resistance (ohms) ($10 \div 5 = \frac{10}{5} = 2$).

Also the case of 1 volt forcing ½ ampere through 2 ohms, is equal to 1 volt divided by ½ ampere equals 2 ohms ($1 \div \frac{1}{2} = \frac{1}{\frac{1}{2}}$ or $\frac{2}{1} = 2$).

Therefore, our third rule is:

The resistance (ohms) equals the pressure (volts) divided by the current (amperes).

Or, briefly, we would say:

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

Again our shorthand being used, we would have:

$$O = \frac{V}{A}$$

We will now assemble our three rules together:

To find:

Current (amperes) .....

Pressure (volts).....

Resistance (ohms).....

Formula

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

$$\text{Volts} = \text{Amperes} \times \text{Ohms}$$

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

Short Method

$$A = \frac{V}{O}$$

$$V = A \times O$$

$$O = \frac{V}{A}$$

We still have another shorthand method of putting these three formulas into one unit, whereby they will be easier to remember. It is:

$$\frac{V}{O \times A} \text{ or } \frac{V}{OA}$$

This formula has no meaning unless you know how to use it. We might say it is three pictures (formulas) taken on one film.

To find an unknown, with two knowns given, you cover up the letter of your unknown and your remaining known letters will give you the formula to find the unknown.

Examples (Note—Let the letter within the brackets ( ) represent the letter you cover.):

To find Volts:

$$\frac{(V)}{O \times A} \text{ or means } V = O \times A$$

To find Amperes:

$$\frac{V}{O \times (A)} \text{ or means } A = \frac{V}{O}$$

To find Ohms:

$$\frac{V}{(O) \times A} \text{ or means } O = \frac{V}{A}$$

After you have once learned your three formulas, you will find that this is the simplest way of remembering it.

Practically the only two measuring instruments used in our electrical problems are a current measuring meter, called an ammeter, because it measures the amperes, and the other is a pressure measuring meter called a voltmeter, because it measures the volts. With these two meters we can find anything for our electrical problems, because an ammeter gives you your amperes, a voltmeter will give you your volts, and with these two given, ohms can be calculated by Ohms Law ($O = \frac{V}{A}$).

When making tests, an ammeter is connected in series with your line or article on test, while a voltmeter is connected parallel with the line or article on test.

Note.—On telephone test desks, the voltmeter is connected in series. This is done because we would be unable to connect our voltmeter, in parallel or across everything we wish to test, such as ringers, relays, lamps, separate circuits, etc., because there would always be something else in series with your tests, such as your line wires, or switchboard cable, etc.

Problems—Reviewing Ohm's Law Formulas

1. A generator delivers 550 volts and the resistance of the circuit is 50 ohms. What will be the current?
2. What must the current be for 2200 volts to force through 70 ohms resistance?
3. What voltage must a generator put out to force 35 amperes through 3 ohms?
4. If a wire has a resistance of 38 ohms and the current is 6 amperes, what would be the voltage?
5. A voltmeter reads 121 volts, and an ammeter reads 11 amperes. What would be the resistance of the circuit?
6. What is the resistance of an electric iron which takes 5 amperes at 110 volts?
7. What will be the current if 24 volts are applied to a 6000-ohm coil?
8. A short circuit is made by placing a screwdriver of 0.005 ohms across 110 volts. What was the current at the time?
9. A cable has a resistance of 0.522 ohms, and a current of 30.24 amperes. What pressure was required?
10. The resistance of a telephone line is 3,842 ohms. If 24 volts are applied, how much current will flow?
11. The resistance of an electric bell is 150 ohms. What will be the current if a 6-volt storage battery is used to ring it?
12. In testing a transmitter short, the voltmeter reads 24 volts and the ammeter reads 0.51 amperes. What would be the resistance of the transmitter?
13. If a ringer has 1,000 ohms resistance and requires .02 amperes to ring it, what voltage will be required?
14. What will be the resistance of an electric heater, that requires 0.2 amperes at 110 volts?
15. If a voltmeter reads 45.1 and the ammeter reads 4.1 amperes, what will be the resistance of the line?

ROCHESTER (N. Y.) TELEPHONE CORPORATION'S ANNUAL REPORT

The annual report of the Rochester Telephone corporation for the year 1930, which has just been published, shows that the corporation had a satisfactory year despite the fact that it, too, suffered from the general business depression. The report shows smaller increases in new business and smaller net earnings than in some previous years. At the end of the year there were 108,586 company-owned telephones, and 3,481 connecting telephones, or a total of 112,067 telephones served by the corporation.

The net gain in company-owned telephones was 3,479 for the year. The report points out that this is the smallest net gain realized by the corporation in any year, and states further that in realizing it the corporation actually had a gross business almost equalling that of its largest year. At the end of the year there were 23.7 telephones per 100 of population in Rochester, which, stated in another way, means that there was about one telephone for every four persons in Rochester.

During the year the corporation made additions to its plant and equipment amounting to $2,562,797, and it took out of service and removed plant and equipment amounting to $1,143,460, so that the net additions to its plant and equipment amounted to $1,419,337 for the year. The report points out that since it began its operations the corporation has actually removed from service and retired more than the total of the plant with which it began its operations in 1921.

The corporation's operating revenues amounted to $5,348,708.86 in 1930, an increase of 2.8 per cent over the preceding year. Operating expenses, per telephone, remained practically at their 1929 level. There was lessened use of the telephone in 1930, the report points out, so that the average yearly revenue per telephone dropped from its usual level of about $51.00, to $49.86. The corporation expects that with improved business conditions the revenues will return to their former level. As a consequence of decreased revenues, the net earnings in 1930 were less than in 1929 by almost $95,000. However, the corporation amply earned its interest and dividend requirements, and made a substantial addition to its surplus.

At the end of the year the corporation's personnel numbered 1,753 employes, and its payroll for the year amounted to $2,748,762. It paid almost $49,000 during the year to 302 employes or their families in the form of pensions, and sickness, disability, and death benefits. To safeguard its pension payments to employes the corporation has established a trust fund with the Lincoln-Alliance Bank and Trust company, as trustee. The corporation has made its calculations of pension requirements on a sound actuarial basis, and pays the required accruals to the trustee. In addition, the corporation appropriated $50,000 out of its surplus in 1930, to accelerate the growth of the trust fund.

During the year the corporation paid $321,900 in taxes, $344,639 for interest, and $394,069 for dividends and added about $314,700, net, to its surplus, according to the report.

Additions and improvements to the Central West Public Service company, Lennox, S. D., have been completed. According to W. C. Martin, manager of the company, the amount expended totaled approximately $15,000. The entire system was rebuilt, ten miles of new open wire was installed and 211 subscriber stations were wired.

Improvements and extensions of telephone service in the mountain states to the tune of approximately $305,000 have been authorized by the Mountain States Telephone & Telegraph company, according to F. H. Reid, president of the company. This improvement in Colorado will consist principally of work on cables and in the central offices.

Lima, Ohio, is the numerical center of the telephone industry of the United States according to calculations recently completed by the chief statistician's division of the American Telephone and Telegraph company.

Obsolete and Modern Telephone Protection

Experiments with Electricity Have Brought About the Invention of Protectors Which Make the Telephone Safe to Use Under Almost Any Sort of Weather and Climate Conditions, According to the Following Article by Ray Blain. He Discusses Scientific Reasons for Lightning Troubles

The progress of a nation is limited only by its ability to abandon habits of the past and to adjust itself to changing times and modern methods.

Looking back to the days when Bryan was a candidate for president one recalls a paragraph which appeared in all telephone directories, to the effect that while every precaution was taken to protect the user, it was advisable not to talk over the telephone during an electrical storm.

During that period it was common practice to make use of a lightning arrester with a knife switch arrangement, so that the line could be disconnected from the instrument during a storm. This was not a bad idea except for the fact that subscribers usually forgot to change the switch back to normal after the storm had passed over, and for this reason the line was sometimes out of service for hours and even days. At that time it was also no unusual occurrence, particularly on rural lines, for the iron drop wire to be connected with a snap and ring of the common harness variety, so that the line could be disconnected from the house during an electrical storm. This was adequate protection no doubt but such a connection was never beneficial to transmission. Also the end of the line was generally thrown on the ground and in wet weather made a perfect contact with it, which put the entire line out of service until all snaps were hooked up again after the storm.

I remember a subscriber on a rural line out in Iowa several years ago who had such a snap arrangement and had his line disconnected one evening for the duration of a severe electrical storm. After the storm had passed he had occasion to call a neighbor so went out in his bare feet to hook the line together. As he had neglected to snap up promptly his was perhaps the last ground to be removed from the line and unknown to him he was to be punished accordingly. The barefoot subscriber got the house end of the line in one hand and reached for the drop end with the other, lifted it off the ground and was just ready to hook the two ends together when some husky subscriber started turning the crank of the five-bar generator at full speed to grind out two longs, two shorts and a long.

Now anyone who has ever experienced the kick of a five-bar hand generator while standing on the ground on a wet day knows full well that it has a kick not unlike the moonshine of Kentucky. Also this was back in the days when long rings on a rural line were what their name implies and even the shorts were not so short. Our barefoot subscriber could not let go until after the sequence of rings were completed, but this did not dampen his vocal powers any. He let out a howl that could come only from a six-footer who thought he was dying by inches. To mention that he was angry is to put it mildly, and, as Andy would say it, he wanted in the worst way to sue someone for assault and battery, but he never knew where to place the blame.

While we have advanced from the Bryan and Free Silver era, to prohibition, stock market crashes and utilities commissions, we have made real improvement in our telephone protective equipment in step with the creation of the world's greatest telephone system. We have reached a point where almost everyone may use their telephone at any time without the slightest thought of danger. While we have learned considerable about lightning since Franklin flew his kite, it is not the only electrical force we must protect the telephone line against in the present age. High tension transmission lines now traverse the country from one end to the other and we must adequately protect all the telephone lines against injury to persons and property should accidental contact be made between the high voltage carrying wires and the telephone circuits.

Lightning Phenomena

We do not know the exact current or voltage of a direct stroke of lightning but we do know that it is so tremendous that it is impracticable to protect telephone lines against it. Engineers of a large electrical company making some tests on a high voltage transmission line in the East a few years ago, trying to ascertain the characteristics of lightning, were able by the utilization of special apparatus to record a pressure of one lightning flash that maintained a voltage of 2,500,000 for a small fraction of a second. One can readily see that such a tremendous voltage with only a negligible amount of current would either pass an ordinary telephone protector as though it was not there or destroy it completely. However, the insulation of the ordinary telephone line is not high enough to carry the current of a direct stroke of lightning to the first protector even though it might be only a short distance, but would travel to ground with disastrous results. Luckily it is seldom if ever that lightning scores a direct hit on a telephone line as the usual trouble from it is an induced current. We assume that lightning is a discharge of electricity between clouds or from clouds to earth. It is believed by most authorities that clouds build up opposite polarities high enough to break down the air insulation between them and neutralize. Take, for example, the aeroplane accident of the Mexican good will flyer who was killed and his plane destroyed by a lightning flash near the east coast some time ago. It is assumed that he flew between two clouds charged at an opposite polarity at about the breakdown point. The plane being a better conductor than the air lowered the resistance between the clouds and caused the electrical pressure to neutralize. The enormous amount of electricity which the plane was forced to conduct brought about its speedy destruction.

Dr. Steinmetz maintained that in reality lightning was an equalization of stresses within the ether.

Lightning Troubles

Trouble most frequently experienced on telephone lines is that caused by an induced voltage from a nearby stroke. This is usually referred to as electrostatic induction. If a negatively charged cloud passes over a telephone line a positive charge will be induced in the line and an equal negative one will attempt to pass to ground. If the cloud passes slowly this charge will go to ground over the low insulation points of the line and will not cause trouble. But should the charged cloud pass the line at a rapid rate the charge on the line may puncture the insulation in the rush to ground.

We may say that the wattage of a lightning flash is not great. But when we consider that the voltage is tremendous, and that the duration of the discharge is exceedingly short, though the current is comparatively small the overall power may be excessive.

In the consideration of adequate protection from lightning we must bear in mind that not only must the large volume of electricity be conducted to ground quickly but that this enormous amount of energy must be taken care of quickly in a way which will not prove destructive to the telephone line.

Contrary to general belief a lightning discharge can be considered as oscillating or pulsating and can be compared to the

EXPLAINING THE T

How Telephone Cables have Grown up

A Bell System Advertisement

In the early days of the telephone business, there were no cables to carry the wires between a man's home or office and the telephone central office. All circuits were bare wires carried on crossarms attached to poles or to fixtures on the roofs of buildings.

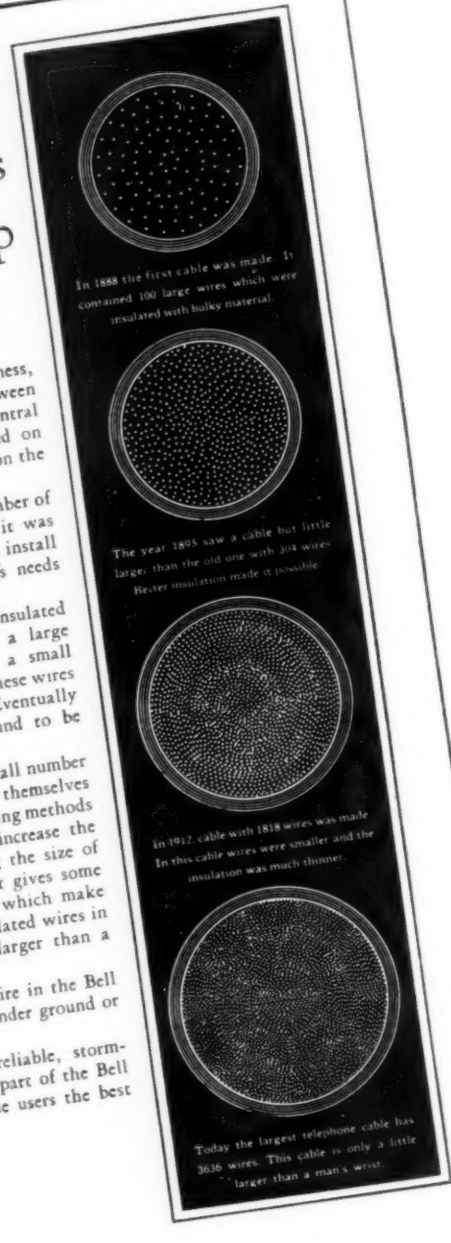
As the telephone business grew, the number of these open wire circuits increased until it was seen that it would soon be impossible to install enough wires on crossarms to meet people's needs for telephone service.

The idea of putting a number of insulated wires together in a pipe to provide a large number of telephone circuits within a small space was first tried out about 1879. These wires were insulated with gutta percha. Eventually the best insulating material was found to be especially prepared paper.

The first cables contained only a small number of pairs of copper wires, as the wires themselves were very bulky. Later, better insulating methods were found making it possible to increase the number of pairs without increasing the size of the cable. The picture on the right gives some idea of the various improvements which make it possible today to place 3636 insulated wires in a lead sheath cable hardly any larger than a man's wrist.

About 93 per cent of all the wire in the Bell System is now in cables, either under ground or suspended in the air.

Placing telephone wires in reliable, storm-resisting cables is an important part of the Bell System's plans to give telephone users the best service that can be had.


In 1888 the first cable was made. It contained 100 large wires which were insulated with bulky material.
The year 1805 saw a cable but little larger than the old one with 304 wires. Better insulation made it possible.
In 1912, cable with 1818 wires was made. In this cable wires were smaller and the insulation was much thinner.
Today the largest telephone cable has 3636 wires. This cable is only a little larger than a man's wrist.

TELEPHONE

to young America

AMERICAN YOUTH is traditionally curious about things mechanical and electrical. . . . "What makes it go?" "How does it work?" . . . Questions like those, and their answers, have sometimes meant much to the march of science.

Designed to appeal directly to this youthful curiosity, advertisements like the one on the opposite page are appearing regularly in juvenile publications. Illustrations are usually diagrammatic. Text is simple, easy to read. Together, they explain many phases of the telephone industry—the various stages in the development of the equipment—the proper way to use it—what happens when a call is placed—the application of the telephone circuit to the transmission of pictures and radio programs.

The results of this advertising are both present and prospective. It stimulates more frequent and intelligent use of the telephone among the young people of today. And it creates respect for the entire telephone industry in the business men of tomorrow.

Advertisement of the American Telephone and Telegraph Company

pendulum of a clock when it is pulled suddenly to one side and let go. The pendulum does not use all of its energy in one swing and then come to rest, but oscillates back and forth, each swing becoming slower and shorter until finally it comes to rest. If the ground connection is of very low resistance and the ground conductor of sufficient size, one rush to ground may be the result without any oscillating. If the resistance of the ground conductor is high the charge may oscillate until the greater part of the energy is turned into heat. In this case the final rush to ground is likely to be violent and take a path where it is least expected and not of the least resistance. This accounts for some of the so-called freaks of lightning. Modern protective equipment, if properly installed, is in practically every case adequate to take care of all electrostatic induction caused by lightning on telephone lines.

Protection from Power Lines

Light and power service of 220 volts and lower is not considered hazardous to telephone lines so usually there is no effort made to provide protective devices which will operate at this low pressure. Direct current voltages of 500 or 550 on trolley systems are considered harmful and protectors are designed to take care of this voltage without harm to equipment if telephone lines become crossed with trolleys or feeders of this potential.

At the present time most manufacturers of telephone protective apparatus do not consider it advisable to adequately protect against a voltage of more than 5,000 volts between wires or 2,900 volts normally to ground on a constant potential A. C. system. It is not claimed that telephone protectors will protect 100 per cent of the time against 5,000 volts, but they will prove adequate in a sufficient number of instances to be considered commercially practical. Some few manufacturers are even more conservative and do not recommend that their protectors will prove effective if a telephone line comes into contact with anything higher than 4,400 volts. However, all telephone protective apparatus on the market today is efficient and entirely satisfactory for the purpose for which it is designed.

The proper physical separation of power and telephone lines should always be considered so that accidental contact between the two will seldom occur, if ever. When the power line voltage is 7,500 volts or lower, a clearance of at least four feet should be maintained. Between 7,500 and 50,000 volts, a clearance of not less than six feet should always be maintained with telephone conductors. Ten feet is even better and a greater distance is desirable when it is possible.

Iowa Advocates Improved Service

H. B. Melick Chosen to Succeed Earle D. Bellamy as President of Iowa Independent Telephone Association

Elimination of grounded and switched lines, and correction of the evils of the small, poorly operated, and out-of-date exchanges, formed the high points of the annual address given before the 36th annual convention of the Iowa Independent Telephone Association by President Earle D. Bellamy. The convention was held at the Hotel Fort Des Moines in Des Moines, Iowa, April 7, 8 and 9.

"The grounded line is not going to tie in with future telephone service," President Bellamy said, "and the switched line is economically wrong; it provides a dual responsibility. It is my belief that we should try to eliminate the switched line as rapidly as possible, substituting in its stead a standard grade of service for the operation of which the telephone company will be entirely responsible, served at a reasonable rate which will provide a profit on the enterprise."

The small, inadequately operated exchange is a menace and liability to all other telephone exchanges which connect with it, according to President Bellamy.

"As a rule it is at some private house where rent, heat and light are furnished free and operated by someone for half what an operator should receive," he said. "The service is poor and not continuous, so the rate is low. The argument in favor of this type of service, of course, is that it does not cost much. But neither is it worth what it costs."

President Bellamy suggested that the successful working out of these problems should be the policy of the association, and that after having bettered service by performing these obligations, an increased revenue should be asked for the improved service.

Iowa Rates Too Low

"In the matter of increased revenue it is a known fact that telephone rates in Iowa are lower than the average of telephone rates in any of the states surrounding us," said President Bellamy. "The profit in the telephone business is such a small per cent of its gross revenue that it seems that in a proper consideration of the service as a whole it could be almost disregarded.

"We should insist on revenues sufficient to maintain a well-built, standard-operated exchange furnishing a complete service to the entire exchange area. In addition to this we should have revenue sufficient to pay as good or better wages than are paid the other wage-earners in our communities. Then we should be able to pay reasonable salaries and after this receive a fair profit."

President Bellamy pointed out to the convention delegates that whether they liked it or not, Iowa telephone companies are about to become a political issue for the next two years.

"The governor of our state in his campaign advocated a general utility regulatory bill, and advocated it again in his inaugural address. Such a bill was introduced in the legislature and included telephone companies," he said.

"The bill is now apparently dead for this session. The position of the Iowa Independent Telephone Association has been that if the state cared to pay for it, we were not opposed to a fair regulation. that Iowa without regulation has enjoyed lower telephone rates than any of the But we have pointed out properly, I think, commission states."

Telephone Directories Important

Among other addresses made during the convention was one by L. H. Larson, directory supervisor, Northwestern Bell Telephone company, Des Moines, who spoke on "Directory Work and Directory Advertising."

The telephone directory, Mr. Larson said, was for a long time considered a sideline and is still so regarded by some companies. But if one stops to think, he said, it is realized that the directory is an important part of telephone service.

Three requirements of a good directory were specified as:

Correctness: the directory must be issued sufficiently frequently to maintain accuracy.

Reference-ability: that is, it must be conveniently arranged for reference.

Durability: it must stand up until the next issue of the directory is issued.

"Wires and Trees" was the subject of a talk by Harry C. Hyatt, of the Davey Tree Expert company, Kent, Ohio. He gave a brief history of the close cooperation between trees and the telephone, especially in the early years when the two industries were in their infancy, and telephone wires were strung on trees instead of the modern preserved telephone poles.

Personnel work among telephone companies was described by L. C. Oberlies, Lincoln, Neb., personnel director, Lincoln Telephone and Telegraph company.

F. B. MacKinnon, president of the United States Independent Telephone Association, gave his popular address on "Maintaining the Prestige of the Telephone Company," and R. A. Lumpkin, Mattoon, Ill., president, Illinois Southeastern Telephone company, and president, Illinois Independent Telephone As-

(*Continued on page 42.*)

Telephone Pioneers to Visit Europe in 1932

Ten Countries Included in Itinerary of European Tour Sponsored by Independent Pioneer Telephone Association for Two Hundred Members and Friends; Trip to Extend from May 27th to August 8th. "Chance of a Lifetime," says Pres. McKinney, Who Made Similar Trip in 1930

A tour through ten major European countries has been scheduled for the summer of 1932 by the Independent Pioneer Telephone Association, according to an announcement just issued by Frank L. McKinney, president, and J. K. Johnston, secretary-treasurer of the organization.

Plans are complete for taking a group of not more than 200 persons abroad, sailing from New York on May 27, 1932, and returning to the same port on August 8, 1932. Countries to be visited include France, Switzerland, Italy, Hungary, Jugo Slavia, Austria, Germany, Belgium, Holland and the British Isles in the order named.

Historic foreign cities to be visited by those on the tour include London, Lucerne, Turin, Monte Carlo, Rome, Florence, Munich, Budapest, Weisbaden, Coblenz, Brussels, The Hague, Warwick, Liverpool, Paris, Interlaken, Nice, Genoa, Naples, Venice, Vienna, Stratford-on-Avon, Heidelberg, Nuremberg, Cologne, Amsterdam, Windsor, and Cobh.

The Pioneers' Association has been famous during many years as the play division of the independent telephone industry. The present tour of Europe has been projected by the association with a view to enabling members of the organization and others actively identified with the telephone industry, their families and friends, to enjoy a magnificent vacation trip next year in the company of many of their life-long friends and under the most favorable conditions.

According to the association officers, individual pioneers have been going to Europe for the past several years, and returning home with most enchanting stories about their experiences abroad. A widespread interest in foreign travel has been aroused by these globe trotters, and more and more of the members are gazing eastward with longing eyes, albeit with a certain reluctance to undertake such a journey alone, or in the company of strangers who might or might not prove pleasant traveling companions.

The Pioneers' tour will make possible the fulfillment of the dreams of many telephone men and women, and at rates that will represent a real saving in comparison with the cost of similar travel either individually or as members of commercial tour groups. The program is one that insures comfort throughout the trip with frequent touches of real continental luxury.

All of the important details connected with the transportation, hotel accommodations, sightseeing, etc., are being handled by season travel veterans included in the organization of Temple Tours Inc. to whom the business management has been entrusted. Under the plan that has been developed and will be followed out when sailing and while in Europe, the officers of the Association with a general executive of the travel company will act as a supervisory committee for the entire party, which will be subdivided into smaller groups of 25 persons each for greater convenience, and an experienced escort and conductor assigned to each. While in Europe, special native guides will be attached to each of these smaller groups, while sightseeing or whenever necessary for the comfort and well being of the party.

Two of the giant 20,000 tons cabin liners of the Cunard fleet will be used by the party in the trip from New York to Havre, and from Liverpool back to the United States. These ships are among the most luxurious boats in their class in the Atlantic service, and members of the Pioneers party will have the freedom of the entire ship, enjoy the famous Cunard cuisine, as well as the certainty of a most happy voyage to and from Europe.

While the primary purpose of the journey will be to enjoy the sights and adventures to be found in the world famous foreign capitals, and to review the equally famous natural beauty spots throughout the continent and England, special trips of inspection will be made to foreign telephone exchanges and plants to examine into the methods and practices in use in these places.

Many national and state leaders in the telephone industry have already signified their intention of becoming members of the Pioneers party. More than a dozen reservations, accompanied by deposit checks, were received by association officers before formal announcement of the tour had been made. The principal difficulty that is now anticipated, revolves about the limitation of the party to 200 members, a number that cannot be increased by reason of the fact that contracts provide for accommodations throughout the trip at De Luxe and first-class hotels only, and suitable quarters can be guaranteed only to the number originally fixed.

Officers of the association have issued an appeal to those who desire reservations for the 1932 tour to make their applications at once. While it seems a long time from the spring of 1931 to the spring of 1932, assignments of space are being made continuously, and reasonably prompt action by those who demand the best in the way of accommodations, will make it an easy matter for the association and the steamship line to oblige them. At present the entire ship is available for booking, on both outward and inward passages, with the exception of perhaps a dozen cabins for which deposits are already on file. Each passing day will see the assignment of additional cabins, until, around the first of the year, only less desirable inside state rooms will be left.

President S. L. McKinney of the Pioneers made a trip to Europe during the summer of 1930, spending approximately the same length of time abroad that will be taken up by the association tour, and which covered a great deal of the same territory.

"I can assure our Pioneer members and their friends in advance," he says, "that those who go to Europe next year with the telephone crowd who have already signified their intention of going, will have the time of their lives. As far as cost is concerned, the trip taken by my wife and myself last year, demanded the expenditure of more than $1500 each, for about the same things the association is now able to offer on a wholesale basis at a flat price of $1,215. Furthermore a great many of the hotels at which we stopped were less pretentious than the fine group of hostelries that will house and dine the Pioneers.

"This tour was planned for the purpose of giving telephone folks a real thrill. It is questionable whether anyone will again undertake the giant task of organizing such a trip for the industry. We intend to advertise it as the 'chance of a lifetime' and I sincerely believe that this statement is 100% true. There will be other chances to go to Europe of course, but the present opportunity offers exceptional advantages that will perhaps never again be available."

A new toll cable is being built from Sterling, Ill., to Clinton, Iowa, by the Illinois Bell Telephone company of the Rockford district. Use will be made of 200 poles and about 60 miles of copper wire. The length of cable being installed in the conduit in Sterling is 745 feet.

THE TECHNICAL CLEARING HOUSE

B. C. BURDEN, Editor

Lightning Arrestor Breakdown Voltage

Q.—What is the average peak breakdown voltage of lightning arrestors which are used in telephone plant?

A.—A carbon block arrestor of the type commonly used for main frame and substation protection will break down at about 350 to 400 volts. Open space cut-outs (arrestors) for use at cable terminals are designed for higher breakdown voltage, usually about 700 to 800 volts.

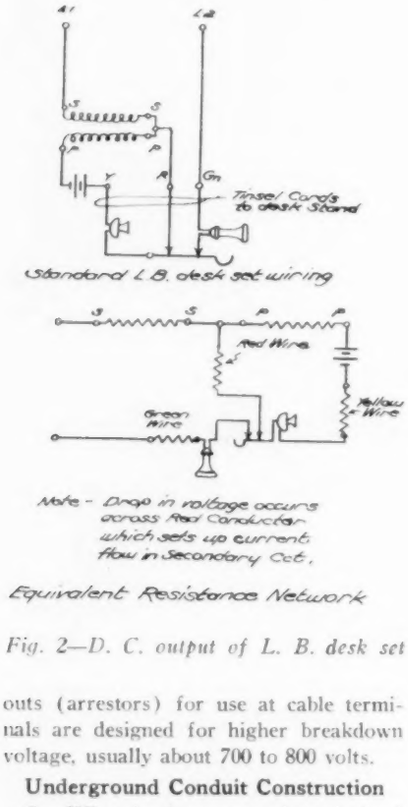

Tinsel Cords to desk Stand
Standard L.B. desk set wiring
Red Wire
Yellow Wire
Green Wire
Note - Drop in voltage occurs across Rec Conductor which sets up current flow in Secondary Ckt.
Equivalent Resistance Network

Fig. 2—D. C. output of L. B. desk set

Underground Conduit Construction

Q.—What is the approved method of grading underground duct runs, and what is the minimum allowable slope per 100 feet of trench?

A.—Figure 1 shows how conduit runs are graded. The minimum fall per 100 feet should be three inches or more.

Cable Construction

Q.—Should cable terminals of less than ten pairs be used in constructing a new cable plant?

A.—The larger companies generally consider that fifteen pair terminals are the minimum size terminals which should be employed regardless of load. A fifteen pair terminal makes the multiple between terminals more flexible, and the saving in first cost between a ten and fifteen pair is too small to offset this advantage.

Radio Interference from Ringing Machines

Q.—We have a ringing machine of the type which uses polarized relays to rectify the A. C. input and then a 20 cycle vibrating reed to pulse the rectified current through a transformer. This machine causes very severe radio interference. Can you tell us which of the vibrating contacts is responsible for this interference, and what method can we use to correct the trouble?

A.—The major part of your interference undoubtedly comes from the vibrating contacts on the rectifying relays. It is very difficult to correct or suppress interference from this type ringing machine by means of choke coils in the input and output leads. It is possible however to almost completely eliminate the noise by rebuilding the machine using copper-oxide type rectifiers in place of the vibrating relays. I suggest you write the Kodel Electric & Manufacturing Co. of Cincinnati, Ohio, who can probably furnish you with information relative to replacement rectifying units which they have available for this purpose.

Direct Current on Secondary Side of Local Battery Desk Set Circuit

Q.—In working with the vacuum tube voltmeter circuit recently described in TELEPHONE ENGINEER, I find that if a local battery desk set is connected to the input terminals of the voltmeter, that the dry cells in the battery circuit of the desk set seem to bias the grid of the input vacuum tube, indicating that the direct current from these batteries must be flowing on the secondary side of the induction coil. This is contrary to the general understanding that the direct current of the local batteries is always confined to the primary circuit. How do you explain this, and how can it be corrected in connection with the testing of desk sets using the vacuum tube voltmeter?

A.—There is a direct current flowing in the secondary circuit of a local battery desk set and while the magnitude of this current is usually very small it is sufficient to affect the grid bias of the vacuum tube voltmeter. This is caused by the drop in potential across the common wire which carries the transmitter and line circuit back to the induction coil. This is shown in Fig. 2. In a wall set this effect is not experienced as the resistance of this wire is practically zero, but in the desk set it is approximately 25 ohm due to the tinsel conductor between the bell box and the desk stand. This can be corrected by using a repeating coil in between voltmeter and desk set.

Wire Chief's Voltmeter Batteries

A.—Can ordinary radio "B" batteries be economically used for a source of direct current voltage on wire chief's test circuits?

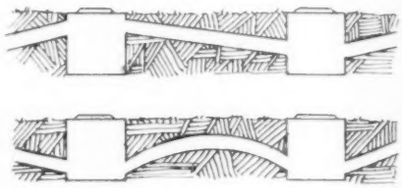


Fig. 1—Conduit grades

A.—Yes, however, it is desirable to use the larger size batteries in order to minimize the voltage drop due to cell polarization with discharge.

Subscriber's Set Wiring

Q.—Does it make any difference as to which contacts the three wires on a local battery switchhook connect?

A.—Yes, it is quite important that the line wire goes to the main contact, the transmitter wire to the next contact, and the receiver to the contact which closes last. Failure to connect in this manner will result in the receiver contacts closing before the transmitter contacts which will cause a severe battery click in the receiver.

Due to an enormous $30,000,000 dam project, the telephone exchange at Linn Creek, Mo., recently was moved a distance of three miles to the new town site. The old location of the exchange is now under forty feet of water due to the completion of the dam, which has flooded the surrounding country and created an inland lake with 1,500 miles of shore. The transfer of the exchange was made with no serious interruption of the regular telephone service.

The new $31,000 telephone exchange system in Pinckneyville, Ill., is now in operation.

Divisional Meeting Held in North Carolina

Southern Telephone Men Enthusiastic Over Success of Convention; Decide to Make Gathering Annual Affair; President McKinnon of National Association, Presided at Meetings; A. L. Staderman, of Terre Haute, and Roy F. Mapes, of Jamestown Give Addresses

Topics pertinent to the advancement of the telephone industry were earnestly discussed by leading telephone men of the South and a few from the North who attended the southern district meeting of the United States Independent Telephone Association held at the Sheraton Hotel, High Point, N. C., April 22, 23 and 24.

Many of those attending the convention were from states where there is no association, and because of the enthusiasm expressed by these men over the great advantages of the meeting, it was decided to make the gathering an annual affair. Bristol, Tenn., was decided upon as the meeting place for the 1932 convention, and Georgetown, S. C., for 1933.

The development of long distance telephoning, the advantages of copper wire over iron wire circuits, various methods of fire alarm service, and the importance of instilling sales-consciousness in the minds of all employes, were among the leading subjects under discussion by the delegates.

All sessions were presided over by F. B. MacKinnon, president of the United States Independent Telephone Association. Other officers of the United States association took charge of arrangements and entertainment for the convention, with the valuable assistance of the North State Telephone company and the High Point Chamber of Commerce.

National Switching Plan

One of the leading addresses was delivered by A. L. Stadermann, of Terre Haute, Ind., chairman of the plant division of the association. His subject was "A National Switching Plan for Telephone Toll Service and the Transmission Requirements."

He pointed out that the increase in toll business has been more noticeable for the long hauls than for shorter lengths. Direct communication with distance points has made possible the elimination of many switches for connecting smaller toll points in one part of the country with similar points in other parts of the country, he said.

"The loading coil and vacuum tube repeater have been largely responsible for the extension of the limits of long distance conversation," he said.

Because the Independent group operates about 25 per cent of the country's telephone stations and originates from 10 to 15 per cent of the toll business passing partly or wholly over Bell toll lines, it is apparent that the Independent group is an important factor in the general toll plan. This fact was emphasized by Mr. Stadermann, who paraphrased the old adage into "a toll service can be no better than its weakest link," and urged that each unit of transmission be made as nearly infallible as possible. For improving transmission, he advised that the start be made at the switchboard.

Mr. Stadermann's address was followed by an interesting discussion in which a prominent part was taken by W. N. McAnge, Jr., Bristol, Tenn.

That a direct relationship exists between decibels and revenues was affirmed by Mr. McAnge. Citing several examples in exchanges of his own company where large transmission losses were located in the circuit, he said that in one case the toll business doubled itself in about four months, and that in another exchange the toll business increased from about $30 per month to $300 and $400, simply by increasing the quality of the transmission of the telephone equipment.

He advocated the employment of transmission engineers to make a check on equipment and lines at regular intervals.

The desirability of replacing iron wire circuits with copper was advocated by J. N. Cox, Cookeville, Tenn., who also took part in the discussion. He said after his company had installed wires of which 80 per cent were copper the toll business increased noticeably.

Telephone Traffic Problems

The principal speaker at the second day's session was Roy F. Mapes, Jamestown, N. Y., chairman of the traffic division of the association, who spoke on "Telephone Traffic Problems."

The importance of special service in small communities, particularly the handling of fire calls, was stressed by Mr. Mapes. He said in concluding that special services should not be furnished beyond that necessary to maintain good public service, and that the traffic methods should so far as possible fit into the methods for nation-wide service.

A general discussion on fire alarm service brought out some interesting points. Alfred L. Geiger, of Washington, D. C., said his company rings the fire siren but does not engage to ring it selectively. It sends out cards reading, "In case of fire, call fire department No. 34." The operator gets the telephone number of the person reporting the fire and switches on the siren. If a fireman calls asking the location of the fire, he is given it.

H. A. Barnhart of Rochester, Ind., said his company advised subscribers, "In case of fire call No. 10." The operators have a list of the fire department numbers and as soon as a fire is reported, the operator calls each number and tells each person who answers that there is a fire and where it is. The ringing of a siren is left to the firemen.

In order to reduce calls for information concerning fires, R. V. Achatz, of Aurora, Ind., told of running advertisements in newspapers requesting patrons not to call for information until ten minutes after the fire alarm had been rung. A similar request was stated on the cover of the telephone directory. He said in this way his company had avoided the difficulty of public relations, yet had successfully convinced subscribers that during a fire there is a real need for emergency service.

Every Employe a Salesman

A sketch of the economic situation in the country and the effect upon various industries of the changes in the habits of the people was discussed by President McKinnon in his address, "Maintaining the Prestige of the Telephone Company."

His address was followed by one entitled, "The Creation of Sales Consciousness in Employes as a Source of Increased Revenue," by W. N. McAnge, Jr.

He said that as a result of efforts to make employes of his company sales-conscious, 60 to 75 percent of them actually are working on sales after regular working hours. Most of this work is done by the traffic and office girls, he said.

Mr. McAnge said he felt his company was far from the saturation point and that the American people have the money to buy, providing the price is right and the product or service is something of advantage to them. He said each employe should study the situation and sell a person only what he can afford and what satisfies his wants.

Another important address was that given by C. E. Archer, of Tampa, Fla., chairman of the southern district of the accounting division of the association, on the subject of accounting and the proposed changes of the interstate commerce commission accounting regulation.

The convention banquet was held the second evening. The hall was well filled,

(*Continued on next page.*)

Successful Add-a-Phone Campaign

Illinois Commercial Telephone Company Makes Bid for Business in Contest; All Employees Participated

The Illinois Commercial Telephone company, with headquarters at Springfield, might well be held up as a bright and shining example to all telephone companies who complain of a slump in business during the present business depression.

Sharing with many other telephone companies the desire to increase business, officials of the Illinois Commercial company, a subsidiary of the Associated Telephone Utilities company of Madison, Wis., decided that nothing was impossible and started out to prove this contention with an Add-A-Phone Campaign during which every employee of the company was made a salesman and every exchange was given a certain quota of new telephone subscribers to be secured during the campaign.

The goal of the campaign was twenty-five hundred new stations. At the close of the four-weeks' contest, lasting throughout the month of February, it was discovered that the company had added 2,888 new subscribers and that 624 subscribers had been sold additional service. This meant that 147 per cent of the original quota allotted to the various exchanges throughout the state had been sold.

Undoubtedly interest in the campaign was stimulated by the contest feature which brought about rivalry between individuals, exchanges and districts. The territory was divided into four districts. Each employee was called a salesman, managers became sales managers, and the district managers acted as district sales managers. The entire Illinois Add-A-Phone campaign was managed by R. E. Putnam. The campaign itself was instigated by O. P. T. Daenitz, sales engineer, from the Madison office, and G. L. Mays, general manager of the Commercial company.

No prize was offered in the event between districts, but there was plenty of friendly competition for the championship, which honor was finally bestowed on the southern district for selling the highest per cent of their quota. A silver and mahogany wall plaque, offered as a traveling trophy to the exchange which sold the highest quota per cent, was awarded to the Sheridan exchange, an exchange in the northern district, where the employees sold 1,020 per cent of their quota.

The exchange quotas, incidentally, were based on the number of employees, with a quota of ten points for each employee.

In each district a Kellogg radio set was awarded as first prize to the salesman who turned in the highest score. The second and third prizes for salesmen were $25.00 and $10.00 respectively.

Five hundred and ninety of the sales made were installed during the month of February.

At the close of the campaign it was discovered that 3,827 prospect cards had been prepared by the salesmen and forwarded to the campaign manager. Three thousand and three of these were on prospective residence subscribers and the balance covered business service. A letter was sent to each prospective subscriber and an advertisement was run in each newspaper once each week for five consecutive weeks.

Throughout the duration of the campaign the company published a miniature daily newspaper called "The Add-A-Phone News" which was used to show the progress of the campaign and to create interest and enthusiasm among the employees.

DIVISIONAL MEETING HELD IN NORTH CAROLINA

(*Continued from page* 33.)

and music was provided by an orchestra secured by the High Point Chamber of Commerce. Harry A. Barnhart of Rochester, Ind., was toastmaster for the evening.

This convention not only afforded Southern telephone men an opportunity to discuss their problems with others, but they were permitted to view the latest telephone equipment, supplies and materials. Those exhibiting during the meeting were:

American Electric company, Inc.; Automatic Electric, Inc.; Anderson Grade Clamp company; L. M. Berry & company; Coffey System & Audit company; Coffing Hoist company; Cook Electric company; Do/More Chair company; Electric Storage Battery company; Everstick Anchor company; French Battery company; Kellogg Switchboard & Supply company; Philadelphia Storage Battery company; Reliable Electric company; Stromberg-Carlson Telephone Manufacturing company; Taylor-Colquitt company.

The executive committee of the New England Telephone and Telegraph company has authorized the expenditure of $1,339,034 for new construction and improvements in the plant, necessary to meet the demand for service.

BIG CONSTRUCTION PROGRAM FOR WISCONSIN

Announcements have been made by officials of the Wisconsin Telephone company to the effect that a $10,000,000 comprehensive construction program will be carried out in the various exchanges owned by the company throughout the state.

Plans for additional telephone facilities in Superior, Wis., include an expenditure of $49,000, of which $29,000 will go for an outside plant and subscribers' telephone equipment, and $20,000 for additional equipment in the central office building to provide for a constantly increasing use of the service. The Superior exchange now provides service to 8,097 telephones.

The Watertown exchange, now providing service to 3,111 subscribers' telephones, will receive improvements totaling $45,000. Of this, $20,000 will be spent for additions to the outside plant in various sections of the city; $8,000 is planned for additional equipment to the central office building; and other additions to plant work will necessitate an expenditure of $17,000.

An expenditure of $19,000 is planned for the Oconto telephone system, providing service to 1,116 telephones. New equipment will be provided the Oshkosh exchange to the tune of $52,000.

LAFAYETTE COMPANY SOLD TO ASSOCIATED

Announcement has been made of the sale of the Lafayette Telephone company, Lafayette, Ind., to the Associated Telephone Utilities company of Chicago and Madison, Wis. The Lafayette company is valued at $2,000,000.

It was organized 37 years ago and operates approximately 9,100 telephones. Management of the company will be turned over to the purchasing company May 1. Frank O. Cuppy, manager of the company for 30 years, will remain in that capacity and there will be no change in the working force or general policies.

The change in ownership was effected through the acquisition of more than 75 per cent of the outstanding stock of the company. The Lafayette company has outstanding 75,000 shares of no par value common stock and $450,000 in bonds have been issued.

The Standard Telephone company is considering plans for construction of a new telephone building in Shattuck, Okla.

The Peninsular Telephone company of Gainesville, Fla., will spend more than $500,000 in its expansion program for 1931, an amount equal to that spent last year, stockholders decided at their last meeting.

Ohio Delegates Compare Notes on Business

Herman Hageman Succeeds J. Warren Safford as President of Ohio Association; Safford Sounds Warning Against Adverse Legislation in Annual Address; Frank L. McKinney Elected Treasurer for Tenth Year; Speakers Forecast Future Business and Discuss "Business Building"

Herman E. Hageman of Lorain, Ohio, was chosen to succeed J. Warren Safford of Troy, Ohio, as president of the Ohio Independent Telephone Association at that organization's annual convention held April 15, 16, and 17 at the Deshler-Wallick hotel, Columbus, O. President-elect Hageman is one of the owners of the Lorain Telephone company.

The Ohio convention, always a popular one, was particularly well attended this year, probably because of the large number of out-of-state visitors who stopped for the convention in Columbus en route to High Point, N. C., for the United States Independent Telephone Association meeting the following week. The dinner dance held Thursday night was an especially gala and festive affair.

Delegates at the opening session were welcomed by Mayor James J. Thomas of Columbus, Governor George White of Ohio, and President J. Warren Safford.

A warning to watch future state and national legislation was sounded by President Safford in his annual address.

"There is no disguising the fact that as Independent operators of telephone properties we are now in the midst of a situation, state and national, more serious than any in which we have found ourselves in the past," he said.

"Just as the growth of a great forest is followed by the appearance of fungus growth and blight, so the development of mammoth utilities in the last ten years has been followed by the eruption of a new species of political bacilli—a noisy, conscienceless group of destructionists who seek a livelihood by laboring to damage the fame and credit of utility corporations.

"While the chief objective remains the large properties, it would be simple folly for us, who in the main are operators of modest plants, to ignore the threat to our own companies. Our only protection against slander and oppression lies in unity of action and in close association within our association for the common good of the telephone industry."

No Broad Toll Charge Fair to All

President Safford told of a careful, analytical study of the cost of originating and handling local toll and long distance business, which was conducted during the past year under auspices of the association. This survey proved, he said, that no broad, general schedule of compensation can be drawn up that will be equally fair to all companies.

The toll committee, according to President Safford, of which former President Frank A. Knapp is chairman, has prepared recommendations through which it is hoped every Independent telephone company, large and small, will be able to cover all its costs chargeable to toll operation and earn a reasonable amount upon the sum it has invested in toll property.

Those attending the convention were advised by President Safford, that it was not too late for any who have lagged in rehabilitation of their properties, to proceed with such a program. He said that it probably would be years before prices are again as low as they are today.

He also suggested that employers exercise care in selecting individuals for jobs in all departments of telephone plants, since the present holds a splendid opportunity for employers to recruit bright, enthusiastic men and women.

McKinney Gives Ninth Annual Report

For the ninth consecutive time, Secretary-Treasurer Frank L. McKinney presented an annual report showing the association to be in good condition. During the past year, he stated, a new record of association accomplishment was established.

"This body," he said, "continues to act as a real clearing house for the Independent division of the telephone industry in Ohio. Its membership includes all classes of companies and it enjoys the enthusiastic support of all the various interests that are represented in this operating field."

Secretary McKinney said that every Independent telephone company in Ohio is earning more and spending less by reason of association operations, than would be the case if no such clearing house existed.

He reminded those in attendance that some companies have made use of the routine service facilities of the association to a much greater extent than others, and asked them to remember that the association can be very helpful in connection with almost any problems that may confront the companies.

Tribute was paid to Secretary McKinney by President Safford who said too much credit could not be accorded him.

"Before retiring I want to express publicly my appreciation of the qualities of leadership and personality in this man such as I have found in few men with whom I have been privileged to associate in business."

Patrons Willing to Pay for Service

Past business conditions were discussed and future business forecast in the general session of the second day. A brief history of the Ohio association was sketched by C. R. Brown of Madison, Wis., operating vice-president, Associated Telephone Utilities company. Fred I. Shoemaker, Columbus, president, Standard Public Service company, outlined the organization of his company in the state.

Said Dr. C. L. Jones, of Athens, another speaker on the program:

"If it had not been for the depression, through which we are passing, the present long distance facilities might have been wholly inadequate. By the time that better business actually arrives, those telephone companies which have taken advantage of the lull will be fortified and ready for the real press of normal business requirements upon the telephone system of the country.

"Should you ask who these companies are, the answer would be: 'Those whose houses are in order with sufficient toll and rental revenue to keep up their plant in a really serviceable condition.'

"In some thirty years I have satisfied myself that patrons do little grumbling at the pay counter if there is evidence of the company having made a consistent endeavor to render them the best service their money will buy."

Another speaker was Randolph Eide, of Cleveland, president, Ohio Bell Telephone company, whose subject was: "Some Thoughts on the Future."

He said the telephone business of the future will require most careful management and rate increases will be undertaken only as a last resort.

"The Service Connection Charge as One Means of Postponing Higher Rates in Growing Communities" was the subject of an address by President-elect Hageman.

Discuss Ways of "Business Building"

The final convention session was devoted to "business building." A. J. Albert, general manager, Standard Public Service company, Columbus, spoke on

(*Continued on page* 42.)

Creosote Not Harmful to Eyes

Head of U. S. Forest Products Laboratory Objects to Warning Against Eye Injury by Creosote

The following is one of several refutations to an article on the subject of creosote burns published in the Line and Desk department of TELEPHONE ENGINEER for March, which have been received at the TELEPHONE ENGINEER office.

It is a direct quotation from the body of a letter from George M. Hunt, in charge of the section of wood preservation for the forest products laboratory, Forest Service, United States Department of Agriculture, at Madison, Wis.:

"We have just read the statement on page 30 of your March, 1931, number of the TELEPHONE ENGINEER, entitled 'Creosote Burns.'

"We believe the publication of this article is likely to have a harmful effect in retarding the use of creosoted wood that will greatly offset any benefit that may come from the warning about possible injury to the eyes. As a matter of fact we think the danger of eye injury is exceedingly slight, even to workmen handling creosoted material, and there is no danger whatever to pedestrians and others passing by creosoted poles.

"I know from personal experience that drops of creosote in the eye are painful but when the eye is flushed out and given reasonable care, to the best of my knowledge no harm ever results. In other words I believe creosote is no more dangerous to the eyes than the thousand and one other things that can get into our eyes at any time and that therefore there is no need for the specific warning of the character of that above referred to."

C. B. RANDALL NEW COMPANY PRESIDENT

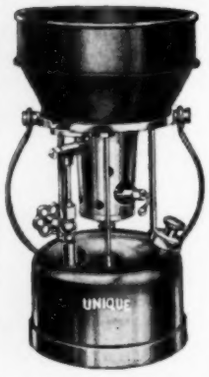
C. B. Randall of St. Paul, formerly vice-president of the Tri-State Telephone company, was elected president to succeed George W. Robinson, who is retiring at his own request.

Mr. Randall also will retain his position as general counsel. He has been active in the telephone business since 1907 and with the Tri-State company since 1912.

Others elected were A. C. Cragg, vice-president and treasurer, R. F. Wilder, vice-president in charge of operations, and R. W. Williams, secretary. A budget of $2,000,000 for plant additions and betterments was tentatively approved by the board of directors.

OKLAHOMA DISTRICT MEETINGS TO BEGIN IN JUNE

The first of the 1931 series of district telephone meetings are to be held in June, according to announcement of C. G. (Pete) Gardner, Chairman, Telephone Division, Oklahoma Utilities Association. The first of these meetings will be held at Beggs, Tuesday, June 9, followed by meetings at Hominy, Wednesday, June 10, and at Tahlequah, Friday, June 12. These meetings will be held under auspices of Sam Hand, manager, Beggs Telephone Company, Beggs; Jack Walton, president, Oklahoma Telephone Company, Hominy; and the Southwestern Bell Telephone Company, Tahlequah, R. J. Benzel, general manager. Features will include commercial and traffic addresses and discussions by women employees of the various telephone companies participating.



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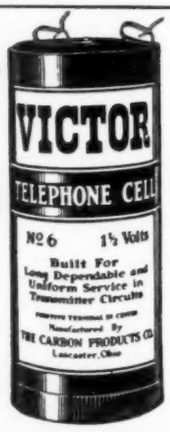

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Characteristics of Strowger Relays*

Discussion of Horizontal Relay Spring Assemblies, With a Theoretical Analysis of Their Action and Means of Controlling Contact Pressure

By K. W. GRAYBILL
Research and Development Department, Automatic Electric, Inc.

The first article of this series discussed certain tests for contact reliability which disclosed the superior performance of horizontal relay contacts having pressures of thirty grams as compared to pressures of five and fifteen grams.

Most horizontal relays are adjusted to have contact pressures for either make or break contacts of approximately thirty-five grams per contact. Conditions sometimes exist which make it necessary to use contact pressures either higher or lower than thirty-five grams. The theoretical analysis of horizontal relay spring assemblies and control of contact pressure will be discussed in this article.

Six different spring assemblies for horizontal relays are shown in schematic form in Fig. 1. Assembly A consists of a break contact and an armature spring and is called a break assembly. Assembly B consists of an armature spring and make contact and is called a make assembly. Assembly C consists of a break spring, an armature spring and a make spring and is called a break-make assembly. Assembly D consists of an armature spring, a break spring, and a make spring, and is called a make-before-break assembly. All other assemblies are made up by combining these basic spring groups in different ways. Assembly E consists of a break-make, a break and a make combination. Assembly F consists of a break-make-before-break, a break-make, a break, and a make combination.

Decimal values appear between the spring symbols of the various assemblies in Fig. 1 which record the air gap in inches that must exist between the residual screw in the armature (See Fig. 2) and the coil core as the springs just break or make contact. For example the springs in assembly A must be adjusted to just break contact as judged visually with a .006 air gap between the residual screw and coil core. The value of .010 inch outside the springs in assembly B is called a stroke value. This stroke value is the normal armature air gap and is met by adjusting the armature back stop (See Fig. 2). Stroke values are necessary only for relays which do not have a break contact as the first spring in the assembly. The contacts in assembly B must be adjusted to just make contact with a .006 armature air gap. The values associated with the springs in the other assemblies will be understood to control the operation of the springs with respect to the armature air gap as described for assemblies A and B.

In addition to the mechanical adjustment requirements controlling spring operation, a requirement is always stated which limits the amount the residual screw protrudes thru the armature. The adjustment of this residual screw varies the air gap between the armature and coil core with the armature operated and the stated requirement is met by adjusting the screw until this air gap agrees with the requirement.

Referring to Fig. 2 it will be observed that the distance from the residual screw to the armature bearing pin is much shorter than the distance from the bearing pin to the center of the bushing which engages the armature springs. The ratio of these two distances is such that for each .001 inch movement at the armature the spring operating bushing moves .00225 inch. The bushing engages the spring between the contact and the spring mounting and considering the spring as a cantilever beam it will be clear that operation of the armature will cause the movement of the contact to be greater than the movement of the bushing. The relation of the spring to the armature arm is such that the contacts move approximately .00275 inch for each .001 inch movement at the residual screw, or move according to a ratio of 2.75 to 1. If a make contact is adjusted to just touch the armature spring with a .006 air gap between the coil core and residual screw, the total deflection of this make contact with the armature in its operated position will be .006 multiplied by the ratio value of 2.75 or .0165, if we assume there is no bending of the armature spring during operation.

The contact pressure resulting from the deflection of make contact springs varies with the amount of deflection and for a given deflection it varies with the thick-

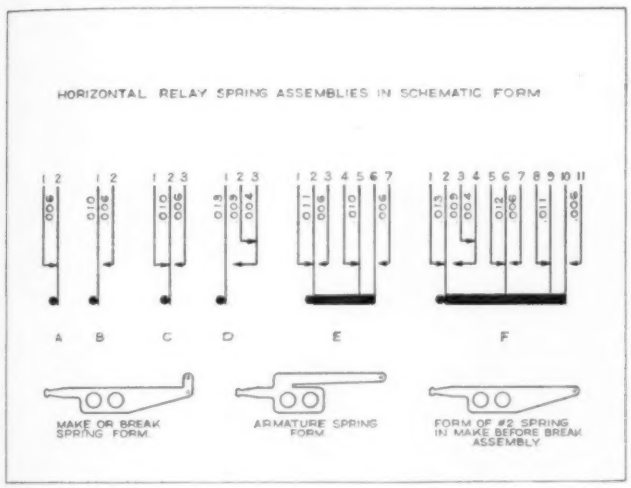

Fig. 1

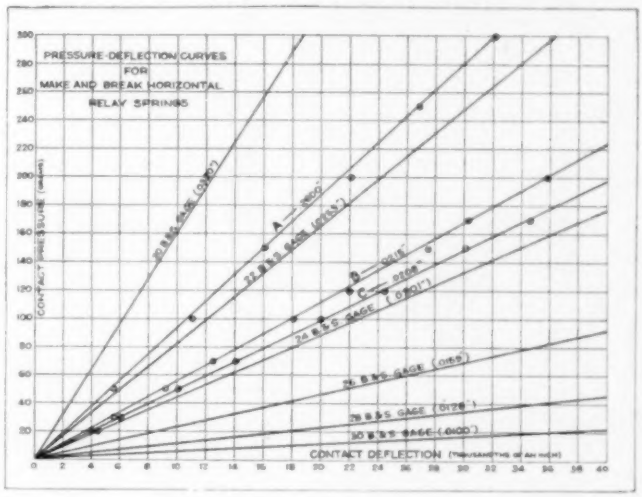

Fig. 4

*Editor's Note: This is the second article of a series by Mr. Graybill dealing with relay characteristics. The third article will appear in the next issue.

ness of the spring material. Data disclosing the deflection-pressure characteristics of Horzontal type relay make contact springs was obtained by tests made as follows:

A number of make contact springs of various gauge sizes were obtained which conformed to standard requirements for hardness. The actual thickness of these springs was measured by means of a micrometer. Each spring was mounted

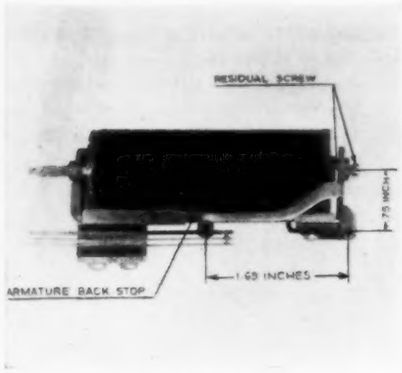

Fig. 2

in a special test jig (See Fig. 3) between standard insulators such as used in a spring pile-up. A micrometer head was rigidly mounted so it could be adjusted to make contact with the contact material on the spring. The amount of spring deflection at the contact could then be read on the micrometer head which was calibrated in .0001 inch steps. Various sizes of gram weights were then hung on the spring in line with the contact and records made of the contact deflection produced as measured by the micrometer. For each thickness of spring, deflection was plotted against pressure giving straight line relationships as illustrated by curves A, B, and C in Fig. 4. Similar data was taken for a large number of springs of various thickness. The deflection pressure curve for any spring is a straight line and may be represented by the numercial value obtained by dividing any given pressure by the associated value of deflection. These values for the samples tested were plotted against thickness of material and a smooth curve drawn thru the points, giving the chart in Fig. 5. The translation of the data taken into the curve shown in Fig. 5 greatly reduced the effect of possible errors in testing or errors due to variations in thickness within a given sample spring. From this latter curve the slope of the deflection pressure curve may be obtained for any exact thickness of spring. We may therefore find from this curve the true deflection pressure curve for a spring which is exactly 26 B&S gauge and we may also find the exact curves for the thickest and thinnest spring material accepted as 26 gauge. Deflection pressure curves for 30, 28, 26, 24, 22 and 20 gauge springs are plotted in Fig. 4 according to data taken from Fig. 5.

Having available accurate information concerning the deflection pressure characteristics of various gauge springs on the chart in Fig. 4, we can readily determine how much deflection is required to produce any desired value of contact pressure on make contacts. If this figure for spring deflection is then divided by 2.75, the armature air gap at which the springs must just touch will be obtained, if we continue to neglect possible bending of the armature spring during operation. For example, with a 26 gauge make contact spring, a pressure of 35 grams would be obtained by a deflection of .0152 inch. To obtain this deflection it would be necessary to adjust the contact to just make with a .0055 air gap (obtained by dividing .0152 deflection by 2.75) between the armature and core. Present practice is to adjust 26 gauge make contact springs which operate in connection with 28 gauge armature springs to make contact with a .006 inch armature air gap which according to previous discussion would produce 2.75x.006 inch or .0165 inch deflection. Such deflection would according to Fig. 4 give 38 grams contact pressure.

However, a condition exists which has not been taken into consideration so far, that complicates the study of make contact pressure. As the armature spring deflects the make contact, the load or pressure exerted by the make contact causes the armature spring to bend rather than to act as rigid arm. This bending results in less deflection of the make contact than that found mathematically by use of the 2.75 ratio. This situation is complicated by the fact that the amount of bending in the armature spring varies as the spring thickness varies and also varies with the addition of other armature springs resting against the one under consideration.

The bending of armature springs due to the load of the make contact pressure has been studied and recorded graphically by securing pressure deflection data with the front end of the springs supported by or between bushings. Since the bending of the armature spring and change in contact pressure vary simultaneously, the determination of exact contact pressures for any given conditions is a matter of trial calculation using the data disclosed by the deflection-pressure characteristics of both the make contact springs and armature springs. Such calculation is too involved for routine engineering work and has been made unnecessary by the preparation of tables such as shown in Fig. 6. Two tables similar to those shown in Fig. 6 have been prepared for each make contact adjustment in common use such as .004, .008, etc. The first table for a particular adjustment value gives the make contact pressure resulting from the use of various thicknesses of springs when an armature spring with no bushing resting on it is in use and the second table gives similar data when the armature spring has another spring bushing resting on it.

On large relay assemblies having heavy gauge springs and several make contacts a small percentage of error in the data previously given will be introduced by bending of the armature arm due to the heavy armature load. For relays with average spring loads no correction in make contact pressure data need be made to compensate for bending of the armature arm.

Contact pressures for spring No. 2 and No. 3 of a make-before-break assembly (see assembly D of Fig. 1) are determined by the deflection-pressure characteristics of spring No. 1, No. 2 and No. 3. As illustrated by assembly D of Fig. 1 adjustment values are given for a make-before-break assembly which requires springs No. 1 and No. 3 to just make contact with a certain armature air gap (.009 in Fig. 1) and requires springs No. 2 and No. 3 to just break

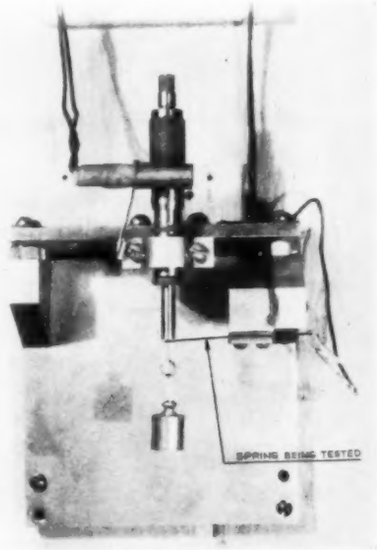

Fig. 3

contact with a smaller air gap (.004 in Fig. 1). The difference between these two values (.009—.004=.005 in Fig. 1) is the distance the armature travels while springs No. 1, No. 2 and No. 3 are in contact. If the outer ends of springs No. 1 and No. 3 are assumed to be free from bending as the springs operate, this difference in armature gaps for the make and break values (.005 in Fig. 1) multiplied by the ratio of contact movement to armature movement (2.75) gives the distance (.0138 in Fig. 1) thru which No. 2 spring deflects during operation. If the deflection pressure char-

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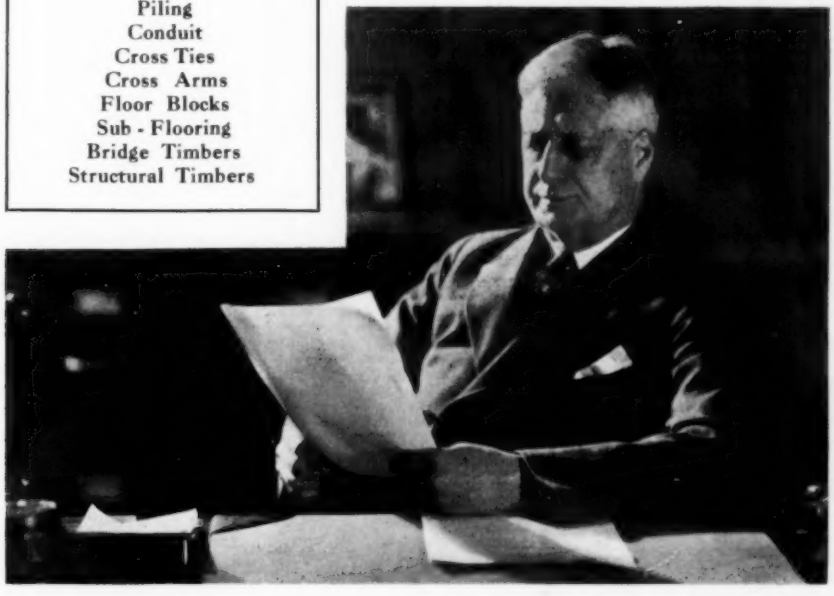

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acteristics of spring No. 2 were known we could find the pressure corresponding to this distance of deflection and would then know the normal contact pressure for springs No. 2 and No. 3. It should be clearly understood that the normal contact pressure for springs No. 2 and No. 3 is the result of a certain definite amount of deflection of spring No. 2; that this deflection results from the amount of "spring tension" stored in spring No. 3 by the adjusting operation; and that this adjusting operation is controlled by specifying the armature air gaps for make and break positions of the contacts. During operation, the necessary that the armature springs be adjusted to provide sufficient resistance (or load) to the armature when the specified non-operate current is flowing in the coil so that the armature can not operate. This spring resistance is commonly called spring tension. With no current flowing in the relay coil this spring tension is utilized in exerting contact pressure against the back contact springs. If we desire to adjust assembly A of Fig. 1 to have 35 grams normal contact pressure we start our calculation by assuming that such contact pressure exists with the armature at normal. By referring to the deflection pressure curve ferent spring assemblies has disclosed that the pressure on the armature bushing is 1.36 times the contact pressure, so that in this case, the armature load as the contacts just separate would be 35.84x1.36 or 47.7 grams. It will be obvious that as the armature moves with the springs in contact, it is relieving the pressure on the back contact spring and also deflecting the armature spring and is therefore picking up the load at a faster rate than it will after the contacts open. With nearly all standard spring assemblies the rates of increase of the armature load before and after the last break assembly just opens are

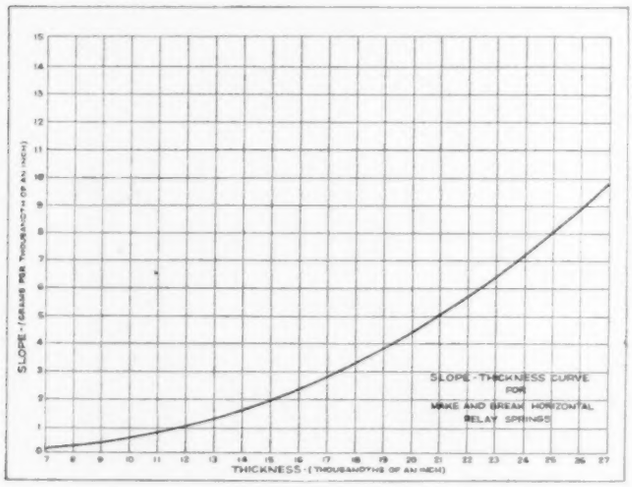
SLOPE - (GRAMS PER THOUSANDTHS OF AN INCH)
THICKNESS - (THOUSANDTHS OF AN INCH)
SLOPE - THICKNESS CURVE FOR MAKE AND BREAK HORIZONTAL RELAY SPRINGS

Fig. 5

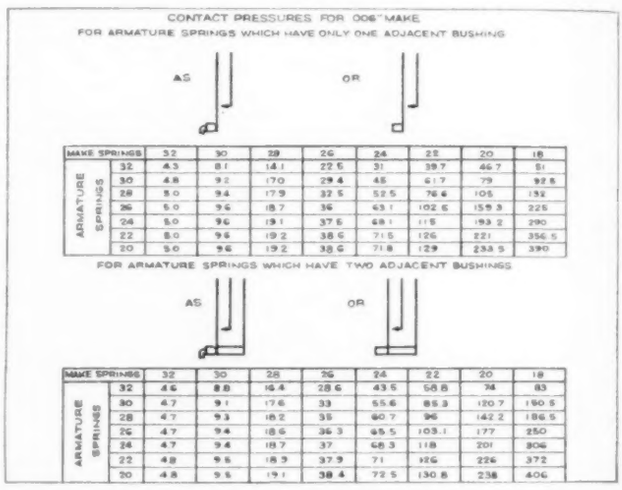

Fig. 6

armature spring bends back as previously described and the end of No. 3 spring twists. Pressure deflection data for each of the two contact positions on the end of spring No. 3 was obtained in the usual way. By making use of the slope values of the deflection-pressure curves for the various springs, one formula was developed which gives the normal contact pressure for spring No. 2 and No. 3 for any desired adjustment condition, and another formula was developed which gives the operated contact pressures for springs No. 1 and No. 3. By means of these formulae, tables such as those shown in Fig. 7 have been prepared for use in routine engineering work. These tables are prepared for various adjustment conditions. Each set of tables shows the normal contact pressure for springs No. 2 and No. 3 and the operated contact pressure for springs No. 1 and No. 3 with the various gauges of springs commonly used, with and without another armature spring resting on the armature spring of the make-before-break assembly.

Contact pressure between the armature springs and back contacts is controlled by specifying values of current flow which shall not operate the assembly. In order to meet such a requirement it is for a 22 B&S gauge spring on Fig. 4, we find that the back contact spring No. 1 must have been deflected .0042 by the 35 grams pressure we have assumed to exist at the contacts. This contact deflection of .0042 corresponds to a movement of the armature opposite the core of .0015 (.0042÷2.75). The armature in operating this assembly starts to pick up the spring load with an air gap between the residual screw and core of .0075 (.006+.0015). During that part of the armature travel when the springs are in contact, the armature is picking up a load which is equal to the sum of the pressure which was causing deflection of No. 1 spring and the pressure built up due to the deflection of the armature spring No. 2 from .0075 to .006 armature air gap. The pressure build up of the armature spring (No. 2) assuming it to be 28 B&S gauge is obtained by referring to the proper deflection pressure curve or by multiplying the value of slope for this spring (.2) by the total distance of deflection (4.2 thousandths of an inch) which gives .84 grams. Therefore 35 grams plus .84 grams (or 35.84) grams is the pressure measured at the contact which is resisting armature operation as the contacts just separate. A series of tests on a large number of dif- such that the maximum magnetic force required to move the armature will be required at the time the last break contacts just open. For assembly A of Fig. 1 if we would therefore specify a non-operate current for a given coil which will develop 47.7 grams pull with a .006 armature air gap, the adjuster will be forced to adjust the armature spring to prevent these springs from opening with the non-operate current flowing, so that the resulting spring pressure will be equal to or greater than the 47.7 grams pull of the armature. With no current flowing the contact pressure will be equal to or greater than the 35 grams pressure assumed in the beginning of the calculation.

Another current test value called "operate current" is also specified which must cause complete operation of the relay, so that the springs can not be adjusted to provide too great an armature load. The operate current is usually about ten per cent greater than the non-operate current although the two values may be closer together if it is desirable to control the contact pressure or armature load within closer limits.

The same procedure is followed in calculating operate and non-operate values of current for spring assemblies which

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It pays for itself.

Sold by Leading Telephone Distributors.

TELKOR, INC., ELYRIA, OHIO
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OHIO DELEGATES COMPARE NOTES ON BUSINESS

(*Continued from page 35*)

"Our Campaign for New Business During 1931."

Mr. Albert demonstrated that company revenues can be materially increased by means of a properly-prepared and systematically followed-out employes' campaign.

"How an All-Year Campaign Assists the Northern Ohio Telephone Company to Obtain and Retain Business," was related by W. C. Henry, general manager, Northern Ohio Telephone company, Bellevue.

In bringing the convention to a close, President Safford said: "We are approaching the close of another successful year and the officers will immediately begin preparations for another bigger and better convention in 1932."

Directors elected at the annual business meeting were: W. B. Gregson, New Philadelphia; Herman E. Hageman, Lorain; W. L. Cary, Newark; Earl Lutz, Circleville; and J. C Boush, Geneva, for three-year terms. J. F. Smith, of Cadiz, was elected to fill out the unexpired term of Paul Christy, of Celina, who is no longer in the telephone business.

Officers elected in addition to President Hageman, were W. L. Cary, president, Newark Telephone company, vice-president; and Frank L. McKinney, secretary-treasurer.

IOWA ADVOCATES IMPROVED SERVICE

(*Continued from page 30*)

sociation, spoke on "Fighting Depression With Increased Sales."

School and Conference

A departure was made from the usual round table discussion on the last day of the conventoin and a plant men's school and a commercial conference was held instead. An operator's conference held the second day of the convention, was in charge of Miss Anne Barnes, traveling chief operator of the association.

At the convention business meeting the following directors were elected for three-year terms: H. R. Christianson, general manager, Iowa State Telephone company, Newton; J. M. Mitchell, general manager, Central Iowa Telephone company, Toledo; J. M. Shea, general manager, Iowa Union Telephone company, Emmetsburg; J. R. Shipley, Central West Public Service company, Omaha, Neb.; Phil Zerwas, manager, Manning Telephone company, Manning.

E. B. Samp, of the Central West Public Service company, Sac City, was elected a director to fill out the unexpired term of J. E. Lynch, resigned.

At a meeting of the directors the following officers were elected: H. B. Melick, West Liberty, manager of the West Liberty Telephone company, president; J. M. Plaister, Fort Dodge, manager of the Fort Dodge Telephone company, vice-president; L. D. Meyers, Woodbine, manager of the Boyer Valley Telephone company, second vice-president; and Charles C. Deering of Des Moines, secretary.

HENRY H. KNIPE DIES

Many friends in the telephone industry mourn the death of Henry H. Knipe, former president and general manager of the Commercial Telephone and Telegraph company of Olney, Ill., which occurred March 11 at St. Petersburg, Fla. At the time of his death, Mr. Knipe was 62 years old.

Mr. Knipe was actively engaged in the telephone business in Illinois for more than twenty-five years, and for many years was a director of the Illinois Telephone Association. He entered the telephone business at Marshall, Ill., in 1902, through a consolidation of five exchanges into a $125,000 organization. This was the nucleus of the Commercial company.

This company grew until, at the time of its sale to the General Telephone company of Chicago in 1926, it operated 13 exchanges serving more than 8,000 subscribers. The following year the properties became a part of the system of the Illinois Commercial Telephone company, a subsidiary of the Associated Telephone Utilities company of Madison, Wis.

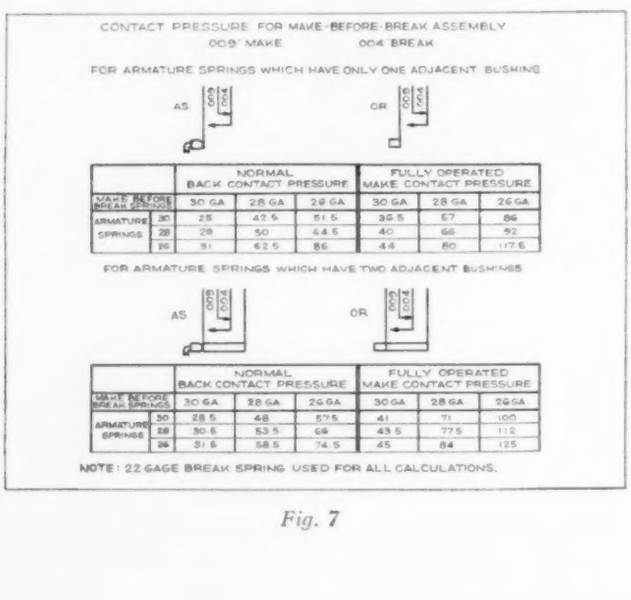
Mr. Knipe is survived by his wife, Mabel Graham Knipe, a son, James L. Knipe, and a daughter.

WESTERN PHONE EXCHANGES IN MERGER

Forty-three telephone exchanges and long distance lines owned by the Associated Telephone Utilities company of Chicago and having 22,407 telephones in 152 communities in Washington, Idaho and Montana, have been merged into the Interstate Telephone company, an Idaho corporation.

include several break contact assemblies, by using the armature stroke value and accumulated armature load associated with the point at which the last break contact assembly just opens. Such large assemblies will be discussed more in detail in the third article of this series.

Many questions will come to the minds of those individuals who are thoroughly familiar with the horizontal type of relay, concerning the effects on the data so far discussed of allowable variations in thicknesses of spring material and allowable variations in adjustment requirements. The basic data, from which the various figures appearing in this series of articles was prepared is complete and permits calculation of contact pressure for either make, make-before-break or back contact springs of any thickness of material that will be encountered or for any allowable variation in adjustment values. In arriving at certain adjustment requirements which are to be generally used it is therefore possible to calculate the extreme conditions that might occur and determine if such conditions are satisfactory. Once this has been done no further consideration need be given to these variations during routine engineering work. Complete calculations considering extreme thicknesses of spring materials and extreme adjustment limits are made for relays which must meet specially critical operating requirements.



MAKE BEFORE BREAK SPRINGS		NORMAL BACK CONTACT PRESSURE 30 GA	28 GA	26 GA	FULLY OPERATED MAKE CONTACT PRESSURE 30 GA	28 GA	26 GA
ARMATURE SPRINGS	30	25	42.5	61.5	36.5	57	86
	28	28	50	64.5	40	66	92
	26	31	62.5	86	44	80	117.5

MAKE BEFORE BREAK SPRINGS		NORMAL BACK CONTACT PRESSURE 30 GA	28 GA	26 GA	FULLY OPERATED MAKE CONTACT PRESSURE 30 GA	28 GA	26 GA
ARMATURE SPRINGS	30	28.5	48	57.5	41	71	100
	28	30.5	53.5	69	43.5	77.5	112
	26	31.5	58.5	74.5	45	84	125

Fig. 7

The third article of this series will continue the discussion of adjustment requirements which control contact pressure; will disclose data concerning coil pull and relay sensitivity; and will discuss other features of the horizontal type relay which assure reliable performance.

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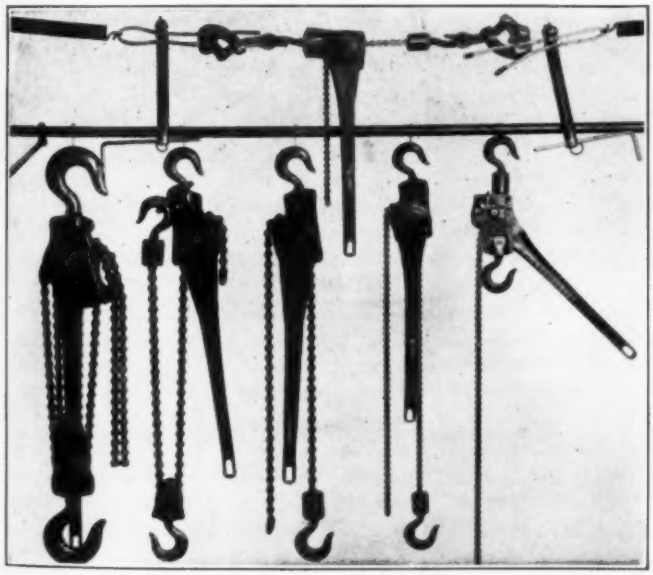

Model Z 6 Ton Weight 65 lbs.	Model F. S. 3 Ton Weight 36 lbs.	Model F. 1½ Ton Weight 25 lbs.	Model A. ¾ Ton Weight 13 lbs.	Model A Reversed

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COST per *service hour*—not cost per *battery*—is the only way to gauge battery prices. A telephone cell that gives only six or seven months of service is high-priced, no matter what you pay for it. Ray-O-Vac Telephone Batteries cost less because they deliver more hours of service than other batteries. Tests conducted in accordance with U. S. Government standards, as well as records of users, prove that Ray-O-Vacs deliver many hours more actual service than most other makes. And over a period of time, there's a considerable saving in service costs alone. It will pay you to standardize on Ray-O-Vacs. They *last* longer.

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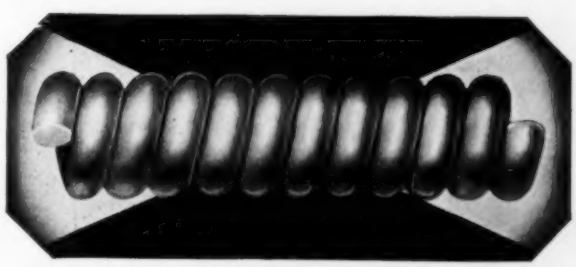

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Prosperity to Lone Star State

Necessity of Educating All Employees to Sell Telephone Service Stressed at Texas Convention

Texas telephone men were advised to prepare for the greatest era of prosperity and development that the Lone Star State has ever witnessed, by L. S. Gardner, of Waco, president of the Texas Independent Telephone Association, at that organization's 26th annual convention held at the Texas Hotel in Fort Worth, Texas, March 24, 25 and 26.

President Gardner said his statement was based upon interviews with telephone men and business men from all sections of the state, and upon a survey of the state's conditions as a whole.

Directors of the association chosen by convention delegates during the business session of the convention were as follows:

T. P. Bearden, Baird, general manager, Home Telephone & Electric Co.; Oscar Burton, Tyler, general manager, Gulf States Telephone Co.; L. J. Darley, Dallas, vice-president Three States Telephone Co.; R. B. Fairly, Lubbock, general manager, State Telephone Co. of Texas; L. S. Gardner, Waco, vice-president, Texas Home Telephone Co.; C. E. Hoy, San Antonio, general manager, Texas Associated Telephone Co.; J. C. Paxton, McAllen, general manager, Rio Grande Valley Telephone Co.; A. L. Robb, Electra, proprietor, Electra Telephone Co.

L. S. Gardner, President, Texas Independent Telo. Ass'n

J. Y. Rust, San Angelo, president, San Angelo Telephone Co.; E. P. Seaman, Georgetown, district manager, Southwest Telephone Co.; D. F. Shilling, Wingate, proprietor, Wingate Telephone Co.; C. A. Shock, Sherman, vice-president, Northern Texas Telephone Co.; Jean Shotwell, Lufkin, general manager, Lufkin Telephone Co.; Sam H. Shutt, Waco, general superintendent, Texas Long Distance Telephone Co.; D. T. Strickland, Dallas, vice-president, Southwest Telephone Co.; J. E. Stuart, Texarkana, assistant to president, Two States Telephone Co.; and Merton Swift, San Marcos, general manager, San Marcos Telephone Co.

President Gardner was re-elected to head the Texas organization by the directors: John Y. Rust, San Angelo; C. A. Shock, Sherman, and T. B. Bearden, Baird, were elected vice-presidents; and Oscar Burton, Tyler, was chosen secretary-treasurer.

A number of interesting addresses were given throughout the duration of the Texas convention. S. P. Grace, assistant vice-president, Bell Telephone Laboratories, New York City, was a convention guest, and gave one of his fascinating demonstrations of the recent advancements in the science of communication.

Telephone "Merchandise"

Miss Anne Barnes, Des Moines, Iowa, traveling chief operator for the Iowa Independent Telephone Association, who conducted the operator's school at the recent Iowa convention, was also a guest of the Texas convention, where she spoke on, "Merchandise." She stressed the importance of educating all telephone employes to sell "telephone service."

"The first class telephone operator today is more than the 'hello girl' or 'Mechanical Central' of yesterday," she said. "She must have at least a high-school education. She receives training in voice culture and must learn the art of speaking and dealing with the public as a sales and service representative of her company rather than a mere 'number getter.'"

The traffic conference of the convention was in charge of E. P. Seaman, Georgetown, district manager of the Southwest Telephone company. Speakers included L. E. Winget, Lubbock, commercial superintendent, State Telephone Company of Texas, on the subject, "Tributary Operating"; R. H. Burfeind, Chicago, sales engineer of Automatic Electric, Inc., on "Economics of the Small Exchange Problem"; John E. Robbins, Jr., San Angelo, traffic superintendent, San Angelo Telephone company, who had for his subject, "The Importance of Accurate Toll Ticket Records"; and R. R. Meyers, Dallas, representative of the Do/More Chair company, who gave an enlightening lecture with lantern slides on "Proper Posture for Operators."

Mr. Burfeind, in his address, said the rural sections of our country have been neglected in the matter of telephone service. "The failure of the farmer to get as good telephone service as the city resident can be attributed principally to the low rate the rural man pays," he said.

Need of Improved Rural Service

"If perfect telephone service can be provided in long distance calls clear across the country or from one nation to another, it seems ridiculous that the rural resident within a short radius of the largest cities does not have good service. The rural rate should be increased and the farmer given service in proportion to the higher rate.

"Better telephone service will mean more than just the satisfaction of having it. The farmer and merchant will be brought more closely together, and the farmer will find himself making many other contacts not possible before."

During the general session, F. B. MacKinnon, Chicago, president, United States Independent Telephone Association, again gave his address on, "Maintaining the Prestige of the Telephone Company."

"Fighting Depression with Increased Sales" was the subject of an address by W. N. McAnge, Jr., Bristol, Tenn., president, Inter-Mountain Telephone company. He described the campaign for increased business staged by his company in Tennessee and Virginia, and outlined the plans followed in selling telephone service to new subscribers.

Executive Committee Chosen

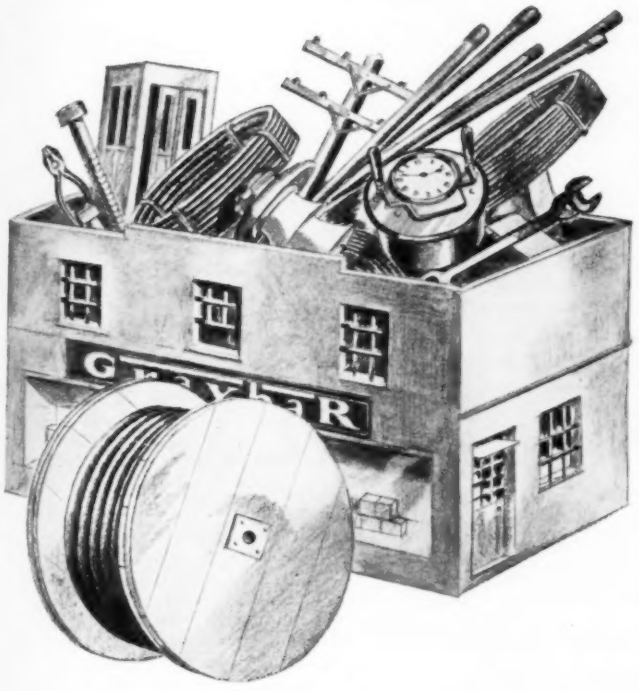
Before the close of the convention, President Gardner announced that he had selected three members to serve with the president and secretary-treasurer as an executive committee, subject to the approval of the board. They were John Y. Rust, San Angelo; C. E. Hoy, San Antonio; and T. P. Bearden, Baird. These appointments were approved by the board.

It was decided unanimously to return to Fort Worth for the 27th Texas association convention. The convention has been held in that city ten times previously, and consecutively for the past seven years.

TELEPHONE SERVICE ESTABLISHED WITH EL SALVADOR

The first international line for Guatemala has been opened. The initial connection was made with the lines of El Salvador, and no additions have been made as yet, although there is some talk of linking Guatemala with Mexico.

for every telephone need



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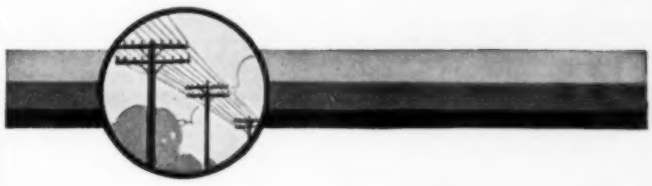

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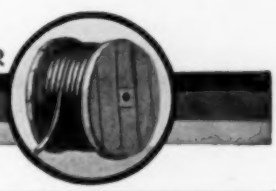

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Telephone Activities Abroad

Dispatches from Foreign Countries Keep United States Telephone Men Informed Concerning Telephony of the World.

Netherlands to Extend Automatic Telephone System

The government telephone service is said to be considering plans for the extension of automatic exchanges throughout the Netherlands to provide 24 hour service in all districts. Costs are estimated at $5,000,000 to $6,000,000 spread over a period of from thirteen to fifteen years.

England Converses with Channel and Canary Islands

The first telephone conversations between London and the Channel Islands were put through last month from the continental trunk exchange in London to a new exchange opened in Guernsey. Conversations travel from London to Compass Cove in South Devon, thence to Guernsey over an old war-time cable which has been reconditioned.

Public telephone service is now available also between England and all parts of the Grand Canary and Teneriffe in the Canary Islands. Communications at present are restricted to calls to and from London, but will be extended as soon as practicable.

Service Established Between Java and North America

Regular telephone service between North America and the Island of Java in the Netherland East Indies was established in April. Voices make the first leg of the journey over the regular transatlantic telephone channels. At London they are switched to Amsterdam over a land line and submarine cable. There they will go on the air through a Dutch short wave station, to be received at Rantjaekek, the receiving station in Java. The transmitter is at Soerabaja. The telephone network of the island, which embraces some 30,000 telephones, is connected to this radio circuit through the long distance center in Gandoeng. The overall length of the circuit from New York to Bandoeng via Amsterdam is about 10,400 miles, and by way of Berlin it is 10,900 miles.

Unusual Train Telephone Service on Swiss Railways

Employees of the Swiss Federal Railway are now authorized to transmit telephone messages given them by travelers, on the form of a telegram. The traveler gives the name and telephone number of the party with whom he wishes to get in touch, together with the message, to an official of the railway. This official telephones the message from the nearest station to where it was given. If the message cannot be delivered by telephone it is transmitted as an ordinary telegram. Charges for each message are 1.50 francs (about $0.29) and the entire message including address, text and signature, must not exceed 15 words or groups of figures. Additional words or figures are counted as though each letter or figure were one word.

Submarine Cable Laid Across Georgia Strait, to Vancouver Island

The laying of the submarine telephone cable across Georgia Strait from Powell River to Cape Lazo on Vancouver Island, British Columbia, Canada, was accomplished recently in five hours time. Connections were completed within a few days. From Cape Lazo messages are transmitted by land wires to Nanaimo, and thence by submarine cable to Vancouver.

Test Radiotelephone Circuit Between Siam and India

A successful test of radiotelephone communication recently was carried out between Bangkok and Calcutta. On this occasion the Siamese Minister of Commerce and Communications, who was visiting in Calcutta, and several officials of the Government of India, conversed with Siamese Government officials for about one hour. Bangkok used the high power station which was recently completed for its European service, while Calcutta adjusted its short-wave telegraphic station for telephonic use. A regular radiotelegraphic service betweeen India and Siam is contemplated as a result of this experiment, and a much more satisfactory service is expected than is now possible via the long land-line which traverses the jungle.

Oriental Companies Adopt Strowger System

Regarding the various foreign concessions and leased territories in China, the Japanese government, which in 1924 adopted the Strowger System for all future automatic work in Japan, has installed this same type of equipment, totaling in all about 12,000 lines, in Dairen, Mukden, Changchum, and Fushun.

Similarly, the Hong Kong Telephone company has followed the lead of the British Post Office, which has also exclusively adopted the Strowger System for the whole of Great Britain, and have, as previously mentioned, recently converted their entire telephone system, consisting of about 13,000 lines, to Strowger automatic working. The Shanghai Telephone company, on the other hand, installed a small exchange of the Rotary type some years ago and today have about 10,000 lines of Rotary equipment operating in Shanghai, with further equipment of the same type in the course of installation.

Telephone Service Available Between England and Morocco

The Postmaster-General of Great Britain has announced that a public telephone service is now available between England and all parts of French Morocco, including Rabat and Casablanca. Communications will be restricted at the outset to calls to and from subscribers in the London area, but will be extended to all parts of the country as soon as possible.

Hongkong-Canton Telephone Service to Open in August

Work is proceeding rapidly in connection with the establishment of telephonic communication between Hong Kong and Canton. The cable is being laid underground and several miles already have been put into position. The line follows the track of the Kowloon-Canton Railway as closely as possible, thus facilitating the work of inspection and repair when needed. To form the link across the harbor from Kowloon to Hong Kong, submarine cable is being brought from England, and will be laid within a few weeks. Unless unforeseen circumstances arise, the service between Canton and Hong Kong will be opened to the public in August.

Telephone Calls in Great Britain Were Increased 34,000,000 in 1930

Statistics showing that over 1,350,000,000 telephone calls were made in Great Britain last year, mark an increase of 34,000,000 as compared with the previous year.

The increase in the number of telephones installed during 1930 was nearly six per cent. The increase in residential installations in London during the year were three times greater than the increase in new business connections. Almost half of the telephones in the London area and 40 per cent in the country as a whole are used for private purposes. The number of public call offices increased by nearly 4,000 to 33,85[illegible] during the year, 800 new centers having been installed in the London area.

Rural party lines declined in popularity and a reduction of nearly 1,000 subscribers is attributed to their replacement by exclusive lines in connection with the opening of 177 new rural exchanges.

Service Is Built Into These Torches and Furnaces

No. 79—1 Quart
No. 80—1 Pint
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No. 42A—1 Gallon
9¼ Shield

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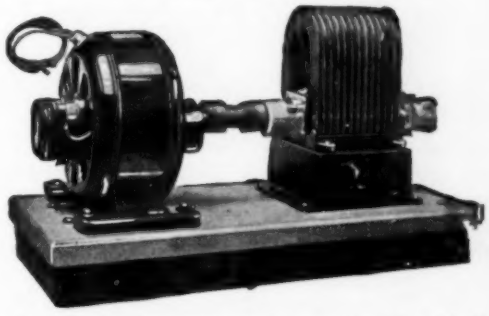
Magneto - Ringing - Motor - Generators

SERVICE ASSURED



It is no longer necessary to undergo periodic and unreliable ringing service.

Holtzer-Cabot Magneto Ringing Motor Generators installed will mean satisfactory uninterrupted service at low cost.

Can be operated from light socket. Eliminates troublesome battery equipment.

Requires no attention other than occasional lubrication. These sets are convenient and positively dependable in operation. Can be supplied for any voltage or special current.

We will gladly furnish you with complete data at your request.

HOLTZER-CABOT ELECTRIC CO.

125 Amory St., Boston, Mass. — 6161 So. State St., Chicago, Ill.

We Carry Complete Stocks of

- TELEPHONES, TELEPHONE APPARATUS
- CONSTRUCTION MATERIALS
- AND SUPPLIES

OUR unusual facilities as manufacturers and distributors of telephones, telephone apparatus and manual and automatic switchboard equipment enable us to render unexcelled service in Western Canada.

Independent Sales and Engineering Company, Limited

VANCOUVER, B. C.

Representatives in Canada for

AMERICAN ELECTRIC CO., INC., Chicago — AUTOMATIC ELECTRIC INC., Chicago
AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Liverpool
THE AUTOMATIC ELECTRIC COMPANY, LIMITED, Chicago

Standard Telephone Co. Pleases "Mr. Smith"

The Story of How the Standard Telephone and Telegraph Company, Dothan, Alabama, Finally Obtained a Subscriber Named "Smith" and How His Descendents Are Pleased by New Telephone Exchange Building and Equipment Is Here Told

By J. T. WALKER
Switchboard Sales Department, Kellogg Switchboard and Supply Company

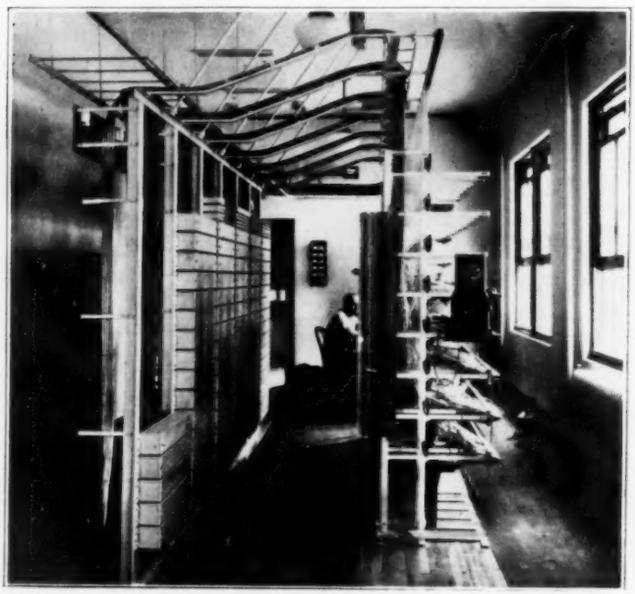
It is commonly supposed that "Smith," as a name, makes up the largest telephone family in existence, that the name appears in more directories and in greater numbers than any other.

Consider, then, the predicament in 1903, when Charley Henderson, Lane Enzor and Harry Calvin organized the Standard Telephone and Telegraph company of Dothan, Alabama. There wasn't a single "Mr. Smith" in the directory, although it contained fifty-three names. These three young men, full of ambition, started out with a sound idea and fifty-three subscribers. Mr. Calvin, superintendent, built manholes and spliced cable, Mr. Enzor took charge of the books and what money there was, while Mr. Henderson ably held the reins.

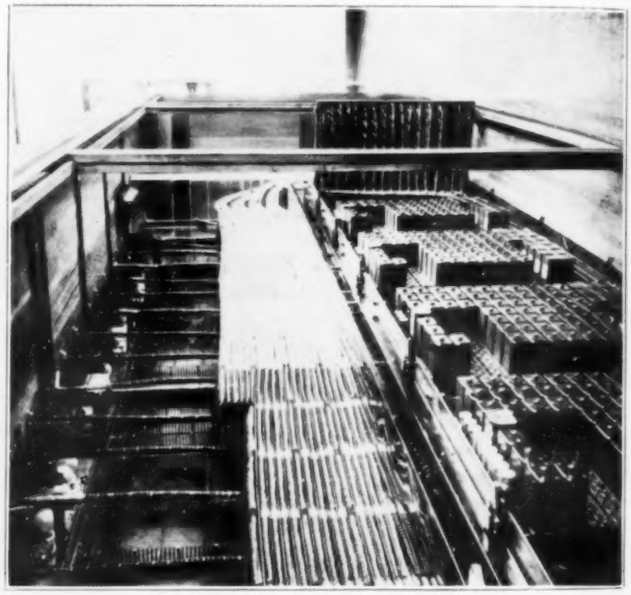
Three years of hard work passed by, while the idea developed and the subscriber list grew. In 1906 a competing exchange, the Dothan Telephone company, was taken over, and with it a hundred sixty-one subscribers. And in the combined directory it was still impossible to find a telephone user named "Smith." Not daunted by this apparent lapse on the part of Providence, the Standard company kept steadily on until one rainy day in 1908 the three partners cornered a "Mr. Smith" in a grocery store, pounced upon him with great glee and sold him a telephone. At least, that's the way the story goes. Some people say that Mr. R. M. Thornton, who joined the company in 1904 as construction foreman (and there was plenty of construction needed), had a neighbor named Smith who borrowed a lawnmover, and when he failed to return it, was convinced by force or otherwise that he must subscribe for telephone service as a penalty for negligence. Probably nobody will ever know exactly what happened, but the fact remains that the "Smiths" got into the directory and have been there ever since. It was a moral triumph for the telephone company, for from then on things happened.

"Mr. and Mrs. Smith" brought up families, which in turn brought up other families by marrying the Joneses and the Browns. The fact is, the town grew. Crops were generally good, there was always plenty of rain; so agriculture became, and still is, the main industry of Dothan. Twenty-two thousand people now enjoy life in this flourishing city in the southeastern section of the state.

As the population increased, the telephone company expanded. In fact it expanded considerably in the region of the pericardium when its president was elected as Governor Henderson of Alabama. His industry and judgment gave that office a distinction which many later "guvners" tried to emulate with less success. Mr. Henderson, now ex-Governor Henderson, still guides the Standard Telephone and Telegraph company as ably as he did the ship of state, while the other two members of the original firm have watched their idea and subscribers' list grow into an enviable reality, the culmination of which was the recent installation of new central office equipment in a magnificent new building.



Terminal Room Showing Relay Rack, Main Frame and Cabling at the Dothan, Ala., Exchange



Rear View of Kellogg Full-Feature Switchboard at Dothan, Alabama

And what a building it is! It is located on a prominent corner, two stories high with full basement underneath, while the pressed brick gives a gleam to the entire exterior and reflects the kindly rays of Alabama sunshine. The interior is resplendent with the best effects of a corps of decorators, while the appointments are complete to the smallest detail. No expense was spared to make it one of the finest exchange buildings in the South, for it now serves as general offices for the entire system which consists of eight thriving exchanges in the vicinity of Dothan.

In keeping with the new building, and nearly dwarfing it in splendor, is the new Kellogg central office equipment. Kel-

THE NEW STEWART DIRECT READING TEST CABINET

Operates on eight No. 6 dry cells, and costs but $2.00 per year to operate. Installed as easy as a telephone. We furnish a mile chart that gives distance to trouble on all kinds of wire. Price $56.00 for 15-volt scale. $61.00 for 150-volt scale. Sent on trial. Write for literature.

STEWART BROTHERS, Ottawa, Ill.

dependable
NORTHERN WHITE CEDAR POLES
that offer *utmost* in Quality and Value.

***Guaranteed* Butt Treatments**

MICHIGAN POLE & TIE CO.
NORTHERN AND WESTERN POLES

NEWBERRY, MICHIGAN

Reed City, Mich. YARDS St. Paul, Minn.

For Every Job

Dependable battery operation is imperative to uninterrupted telephone service.

Exides are dependable. Thirty-five years of service in the telephone industry have proven that. Dependable Exides assure a long life of satisfactory service.

DEPENDABLE EXIDE BATTERIES

Exide BATTERIES

The Electric Storage Battery Company

Philadelphia Penna.

Note Protection at Corners

Blake Insulated Staples
Trade Mark

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

Blake Signal & Mfg. Co.

BOSTON, MASS.

Suttle Loud Ringing Extension Bells

Two six-inch gongs mounted on wood panel with heavy clapper. Heavy duty ringer entirely enclosed. Finish black. Just the thing for garage, warehouse, barn, or other building where a loud ring is required.

No. 199—For magneto system, 1,000 or 1,600 ohm ringer, each $7.50

No. 299—For common battery system, 1,000 or 1,600 ohm ringer, each $8.00

Increase Your Rental Income with Extension Bells

A RENTAL charge of 25 to 50 cents a month extra soon pays for these handy extension bells. Many of your subscribers are in need of such bells and can be easily induced to allow you to install them.

The two bells shown here are very popular. They are handsomely finished and guaranteed to give perfect service. Sell your subscribers on the idea and get in on these extra profits.

Suttle Special Extension Bell Boxes

Beautifully refinished oak boxes, bells finished in black, mounted on top or front. Can be furnished with any standard make ringer specified any ohms required. Just order No. 198 to any specification you want it.

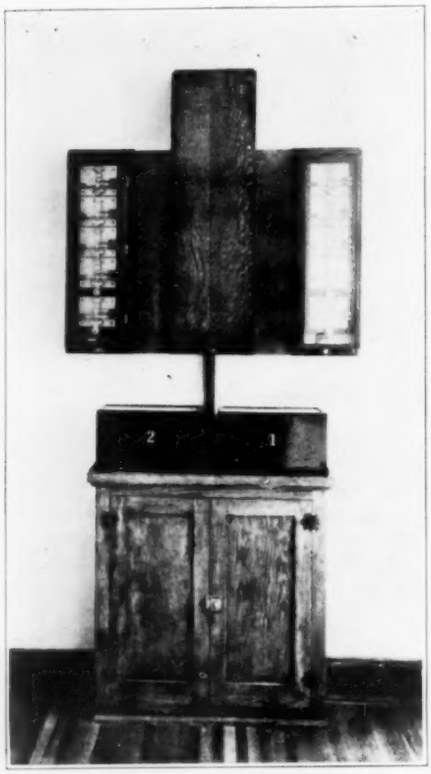
No. 198—Extension Bell Box, any ohms, magneto systems only, each $3.00

Suttle Equipment Co.
Lawrenceville, Illinois

logg was chosen without hesitation, because of the keen business acumen and foresight of the Standard company. It was selected because it will serve "Mr. Smith," the telephone user, with the ultimate in service—a service which cannot be equalled with any other equipment. It makes money for the telephone company, and is a constant source of joy and pride to all the employees, as well as to Messrs. Henderson, Enzor and Calvin.

New Telephone Building Recently Constructed by Standard Tel. & Tel. Co., Dothan, Ala.

Two Kellogg switchboards of six positions each were installed, one for local service and one to care for the rapidly growing toll requirements. The woodwork is of solid mahogany with a finish which is approached by only the finest of pianos. A magnificent desk of mahogany is provided for Miss Hattie Mizelle, the chief operator, who ably supervises the entire operating force. Corresponding equipment is at the disposal of J. W. Hansen, wire chief, who cares for the 1,600 lines in service at Dothan and watches over the central office apparatus with the greatest of care.



Duplicate Ringing Equipment with Double Kellogg Pole Changers and Interrupters at Dothan, Ala.

The Kellogg Switchboard and Supply company furnished the complete equipment from 50-ampere batteries to duplicate ringing interrupters. For, of course, Dothan is served by modern automatic, harmonic ringing. Details of the construction and layout of the apparatus are shown in the accompanying pictures, while further information can be secured by addressing the Kellogg office in Chicago.

The cut-over took place at 10:30 p. m., July 26, 1930. It was attended by the local Rotary Club and other civic bodies "en masse." Undoubtedly, among the onlookers, several subscribers named "Smith" watched the proceedings, marvelled at the equipment, and now know why they are getting the finest telephone service in the world.

TELEPHONE NUMBER CHANGE IN NEW YORK

Telephone numbers in New York City have now been "modified" in exactly the same way as Northern New Jersey's telephone numbers were last summer, by "numbering" the central office names. A threatened famine of suitable exchange names has thus been avoided and the telephone numbering system of the metropolitan area that includes New York City and metropolitan northern New Jersey is now unified.

Telephone numbers were not changed, telephone company officials point out, and only the central office names themselves were affected by the new plan, which changes "Worth," for instance, to "Worth 2," "Longacre" to "Longacre 5," and so on. A number such as "Courtlandt 1234" has now become "Courtlandt 7—1234."

DIRECT LINE CONNECTS TEXAS WITH MEXICO

Long-distance telephone lines are being strung between Metamoras, Mexico, just across the border from Brownsville, Texas, to Monterey, giving the lower valley its first direct telephone connection with North Mexico's principal city. Although there is a line between Brownsville and Metamoras, it previously has been necessary to relay long-distance messages into Mexico through Laredo, Texas.

TELEPHONE SAVES SPEAKER 1,500 MILE TRIP

Without leaving his desk at the La Salle Extension University in Chicago, J. G. Chapline, president, was the principal speaker recently at a banquet of La Salle students in Mexico City.

J. G. Chapline, President of the La Salle Extension University

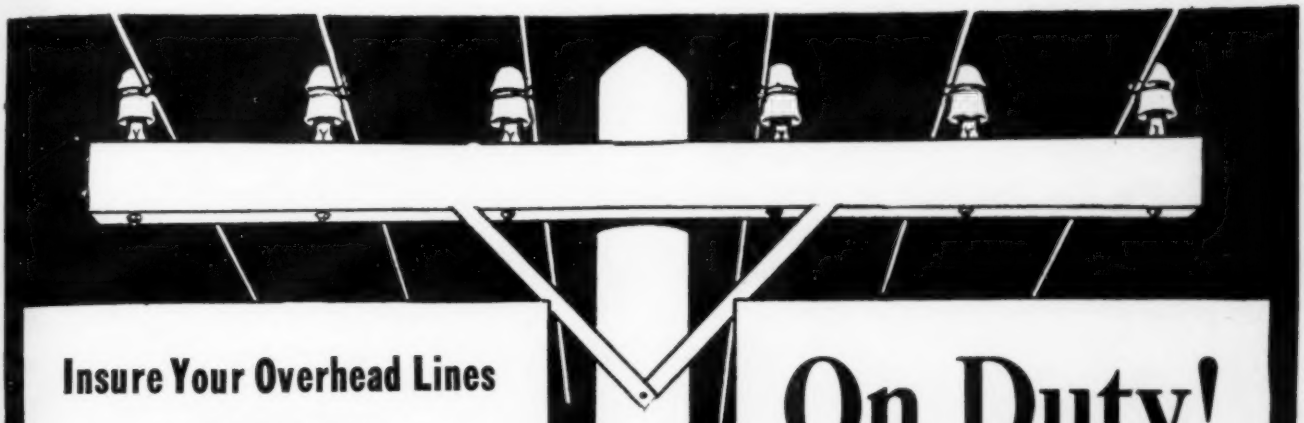
This was accomplished by a hook-up through courtesy arrangements of the Mexican, and American Telephone and Telegraph companies which cleared 1,500 miles of telephone wire over which Mr. Chapline's voice was carried.

Amplifiers in Mexico City broadcast his talk to several hundred La Salle students in Mexico and officials of the Mexican Telephone and Telegraph company.

WHY HARP ABOUT IT?

An auto crashed into a telephone pole and the driver was picked up in an unconscious state entangled in the wires. Just as his rescuers feared the worst, a smile swept over his face and he was heard to murmur as he fingered the wires: "Thank Heaven, they've given me a harp!"

Emergency born of a howling March blizzard saw the opening of the trans-Missouri underground telephone cable, without the formal celebration planned for the event. The cable, which crosses Missouri beneath the shoulder of Highway 40, was hurriedly cut into service when sleet, high winds, and clinging snow snapped telephone wires and razed 500 poles in Northern Missouri and Illinois.



Insure Your Overhead Lines

BY SPECIFYING

MacGillis

NORTHERN or WESTERN

CEDAR POLES

PLAIN or BUTT-TREATED

FROM

120 E. Wisconsin Avenue

The MacGillis & Gibbs Co.

MILWAUKEE - WISCONSIN

Carney

Producers of

"CARNEYPOLES"

of

WESTERN RED CEDAR

Plain or Treated

B. J. CARNEY & CO.

100 No. Seventh St. Minneapolis, Minn.

Cedar Poles

Northern White Western Red

Plain or Treated Butts

Prompt Shipment from Minneapolis Yard.

T. M. Partridge Lumber Co.

Minneapolis, Minn.

On Duty!

- - since the turn of the Century

NORTHERN White Cedar Poles are long-lived. A great number of them have been rendering reliable service since the latter part of the nineteenth century. They have served through long years without decay; they have stood fast in all kinds of soil; they have the necessary stamina to hold up when the wind and sleet tugs at their crossarms.

Northern White Cedar Poles have the ideal taper that guarantees firm anchorage in all types of ground (one inch to every five feet), they have large, firm butts that give great strength at the groundline, they are endowed with a high resistance to decay.

Northern White Cedar Ass'n

Minneapolis Minnesota

Northern White Cedar Poles

With Manufacturers and Jobbers

PREMAX PRODUCTS REORGANIZED

Premax Products, Inc., Niagara Falls, N. Y., which has been in Federal Receivership since October 20, 1930, has been reorganized and will henceforth operate as Premax Products Corporation, at the same address.

The company manufactures a very complete line of stamped and formed metal specialties, including aluminum and brass letters and numbers, sold to the hardware, railroad, public utility and other markets, a line of steel stakes, poles and assemblies for tents of all types, radio ground rods and aerial equipment, as well as a number of other metal products. The business has been in continuous operation in Niagara Falls for more than 30 years, and it is the intent of the present corporation to continue and expand the various lines.

Premax Products Corporation is headed by Mr. Chester M. Woolworth, president, who is also president of Animal Trap Co. of America. Mr. Donald P. Braley, the new general manager, is a former operating executive of Animal Trap Co. Mr. George O. Benson, sales manager of the former organization, continues in the same capacity with the new company.

It is stated that the former handicaps of insufficient working capital, etc., have been properly remedied by the adequate set-up of the new company.

MODERN PLANT MAKES HIGHER EFFICIENCY

The accompanying photograph shows the plant of the Kester Solder company, manufacturers of the famous self-fluxing Kester Solder used in industries and homes.

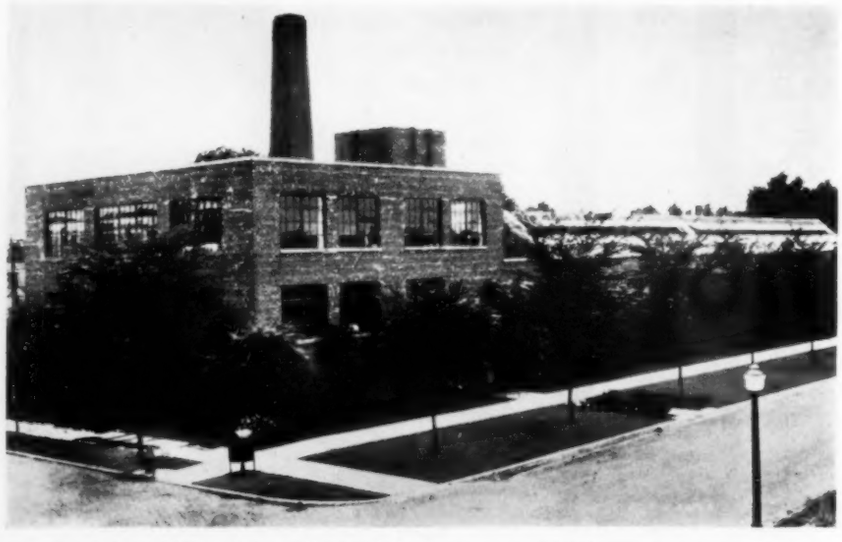
This model plant is located on Wrightwood avenue in Chicago, the buildings occupying an entire block. The grounds surrounding the buildings are beautifully landscaped, and since the nearest neighboring factories are several blocks away, there is nothing to keep the sunlight from streaming into every office and plant building through wide and almost ceiling-high windows.

F. C. Engelhart, president, says, "Our home was built and is being kept up, with the thought that no one thing so vitally affects efficiency and business relations, as the right kind of surroundings and pleasant working conditions."

The most modern methods of production are used, and there are many special machines and operations that were designed by Kester Engineers and are used only in Kester Plants. This is one of the many reasons why Kester products are beyond imitation.

Employees of the Kester Solder company spend their lunch hours in a large and cheerful dining room, where delicious food is served to them at reasonable prices from a completely equipped, modern kitchen. Fully equipped rest and recreation rooms are also at the disposal of employees.

Quoting President Engelhart again, "It is our belief that this attention to environment is chiefly responsible for the fine spirit of friendly cooperation which exists between all departments and individuals of our organization. With this belief in mind the Kester Plants at Chicago and Newark are kept in perfect shape."



Modern Plant of the Kester Solder Company, DRIV Wrightwood Avenue, Chicago, Covering an Entire Block

ANNOUNCEMENT

The Frank L. Eldridge company, which has been located in room 1239, 11 South La Salle street, Chicago, has recently moved to suite 1434 which provides more spacious quarters with a better location than formerly occupied.

Mr. Eldridge represents the French Battery company of Madison, Wis., and the Do/More Chair company of Elkhart, Ind. He will be very glad to have his many friends identified with the telephone industry make his new office their headquarters whenever in Chicago.

RADIO IS IMPORTANT TOPIC AT ROCHESTER CONFERENCE

Seventy-five sales representatives of the Stromberg-Carlson Telephone Manufacturing company returned to their headquarters last week after attending the annual sales conference of the company at Rochester, N. Y., May 4, 5 and 6.

The conference was opened by W. Roy McCanne, president. Sales and merchandising was the first topic discussed. The latter part of the first day's session was devoted to radio and was in charge of Harry A. Beach, radio sales manager. Talks were given by Ray H. Manson, vice-president and chief engineer; Benjamin Olney, acoustical engineer, and E. A. Hanover, vice-president and purchasing agent. Mr. Hanover told of broadcasting over the Stromberg-Carlson hour, heard on the N. B. C. Blue Network every Monday night.

Following Mr. Hanover's talk the representatives visited the radio broadcast studios where the Rochester Civic Orchestra broadcasts the regular Stromberg-Carlson Hour program.

Advertising and sales promotion was the order of the day on May 5. Throughout the three sessions enlightening addresses were delivered on the subject.

Wednesday, May 6, was given over to telephone subjects. Talks were given by E. R. Stonaker, consulting traffic engineer; A. J. Roberts, manager of Kansas City branch; John H. Levis, Jr., telephone engineer; P. Winemiller and J. P. Galligan, sales engineers; E. S. Browning, chief installer, and A. O. Stigberg, planning engineer.

Addresses during the afternoon session were given by J. S. Gibson, merchandise manager; H. T. Brinton of the Habershaw Wire company; J. E. Finley, sales representative; C. D. Kinne, sales engineer; C. A. Sweet, sales representative, and S. K. Beecher and R. C. Reno, advertising department.

Benefit Plan for Stromberg-Carlson Employees

Company's Workers in Years to Come Will Be Protected During Periods of Depression

With the view to protecting its employes during the many future years in which it intends to serve the independent telephone operating companies, Stromberg-Carlson has adopted a plan by which workers will receive a large percentage of their wages during idle periods. Throughout the present winter the company has maintained practically its full working force, although, of course, at somewhat reduced time, but the new plan, which calls for a reserve to be used as a basis for unemployment benefits is intended to provide for such workers as have to be laid off in the future a substantial part of their income.

The proposed payment of benefits is not only evidence of Stromberg-Carlson's permanence in the telephone field, as pointed out by newspaper editors commenting on this enterprise, but such a plan, if widely adopted, will serve as a deterrent to industrial and mercantile depressions. It will prevent a destruction of purchasing power among the idle employees and, with the benefit money in circulation, business slumps will not be so pronounced.

Under the plan the company will accumulate an Unemployment Benefit Fund, beginning this year, by setting aside one per cent of its total payroll annually until the fund reaches a maximum equal to five per cent of its total payroll. In normal years the entire expense will be borne by the company; there will be no contributions from employees, except that the company reserves the right to declare an emergency in a period of extended unemployment and, during the emergency have the fund supplemented by contributions of one per cent from all officials and employees not receiving benefits, the company to contribute during the period an extra amount equal to that received from such employees.

All employees with service of six months or more and receiving less than $50 a week will be eligible to receive unemployment benefits. The benefits will be 60 per cent of the normal pay, with a maximum of $22.50 a week, the period of benefits varying from four weeks for employees with six months' service to 13 weeks for employees of five years' service and over. Unemployment benefits are to be paid after two weeks' unemployment.

Benefits will be paid to part-time workers in case their earnings are less than they would receive in benefits if they were totally unemployed. An employe obtaining temporary work outside will still be eligible for benefits, but in no case are his benefits and temporary earnings plus the benefits to exceed his normal earnings previous to the layoff.

"This plan is an effort to minimize the effect on the employee of future depressions," says W. Roy McCanne, president of the company. "Besides its humaneness, probably the plan's greatest benefit will come from stimulating efforts to prevent future unemployment and retarding the effects of unemployment on busness in general."

TEXAS TELEPHONE COMPANY ACQUIRES EXCHANGES

Permission has been granted the Southwestern Associated Telephone company by the Oklahoma corporation commission, to acquire all properties of the Standard Telephone company of Texas, and of the Oklahoma Associated Telephone company located in the following Oklahoma towns:

Arnett, Heber, Buffalo, Cheyenne, Forgan, Freedom, Gage, Gate, Knowles, La Verne, Rosston, Shattuck, Supply, Texhoma, Waynoka, Catsby, Clearlake, Edith, Fairvalley, Fairview, Fern, Gray, Harmon, Kibby, Lovedale, Salt Springs, White Horse, Agra, Billings, Carney, Coyle, Glencoe, Marland, Morrison, Mulhall, Perkins, Red Rock, Ripley, and Yale.

The Oneida Telephone company exchange building was completely destroyed recently in a fire which threatened to destroy the entire town of Oneida, Wis. A temporary exchange was set up in the agent's home in Oneida, although it was necessary to secure a new switchboard before complete service was restored.

E. A. Reinke, commercial sales manager of the Stromberg-Carlson Telephone Manufacturing Company, completed his 30th year of service with that company on March 21.

Stockholders of the East Alto Telephone company, East Alto, Wis., have approved the merger with the Waupun exchange of the Wisconsin Bell Telephone company. At present the East Alto company reaches about 200 homes, but when the merger is effected the subscriptions of the combined exchanges will reach approximately 1,200 homes.

The Central West Public Service company of Early, Ia., has asked for a twenty-five year franchise to operate a general telephone and telegraph system in the town.

A new telephone system is being installed in Sparta, Ill., at a cost of $60,000.

At the annual meeting of the New Brunswick Telephone company held recently at Frederickton, New Brunswick, Canada, it was announced that between $750,000 and $1,000,000 will be spent on the company's plant during the present year, including the completion of the automatic system in Saint John.

Although American Telephone will request stockholders to approve an increase in the authorized capital stock from $2,000,000,000 to $2,500,000,000 at the annual meeting, it has previously been indicated that no new stock issue is contemplated this year. The outstanding stock now aggregates about $1,800,000,000.

The Keystone Telephone company of Philadelphia has declared the regular quarterly dividend of 75 cents on the $3 preference stock, payable May 1 to stock of record April 22.

Plans are under way for improvements for the Green Ridge exchange, Green Ridge, Mo., of the United Telephone company of Clinton, Mo., according to District Manager T. R. Schweer. A new switchboard will be installed and a larger underground cable will replace the present overhead cable system. New poles and wires will substitute for old ones, where changes are needed.

The Twin Cities of Festus, Mo., and Crystal City, Mo., operated by the Scotia Telephone company, recently were cut over to a complete new common battery system, made by the Kellogg Swithboard and Supply company. The Scotia company also plans to install a new Kellogg switchboard in the exchange at Marble Hill, Mo.

The Southern Indiana Telephone company is proposing to establish a switchboard to care for its telephones in Guilford and Yorkville, and will offer switching service to the farm mutual lines in the vicinity of these villages.

The general offices of the Illinois Commercial Telephone company will be moved from Murphysboro, the present headquarters, to Springfield, during April.

STROMBERG - CARLSON DECLARES REGULAR DIVIDEND

Directors of the Stromberg-Carlson Telephone Manufacturing Company of Rochester, New York, declared a regular quarterly dividend of $1.62½ on the preferred and the regular quarterly dividend of $.25 payable December 1st to stockholders of record at the close of business November 17.

In 1927 and 1928, four regular dividends and one extra of $.12½ were issued. During 1929, four regulars and two extras were issued, while this year four regulars and three extras have been paid.

We will sell your
Telephone Directory ADVERTISING
or will publish your directory complete
L. M. BERRY & CO. DAYTON, OHIO

Send for free sample and prices on
UNIVERSAL DROP WIRE INSULATORS
Universal Specialty Company
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Rebuilt
WALL TELEPHONES
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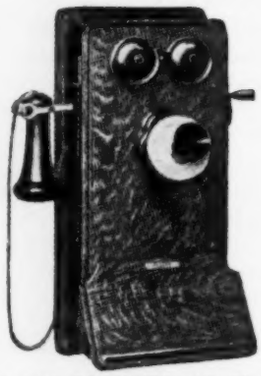
NEW OAK CABINETS with Western Electric or Kellogg transmitter, ringer, generator and coil.
3-Bar, 1000 .....$ 8.00
5-Bar, 1600 ..... 10.00
Telephone Repair Shop
1760 Lunt Ave., Chicago, Ill.

RECONSTRUCTED EQUIPMENT

Kellogg No. 2531 inside connection 4-bar 1600 ohm Bdg. compacts with push button, Alternating and pulsating current Gen. and Condenser. Wired secret call to Central on Grounded lines @	$ 9.00
Kellogg No. 2696 type 4-bar 1000 or 1600 ohm Bdg. compacts @	8.25
Western Elec. No. 317 inside connection 3-bar 1000- or 1600 ohm Bdg. compacts @	8.25
Kellogg No. 28 Unbreakable type desk set with W. E. No. 315 inside connection 3-bar 1000 or 1600 ohm signal sets @	10.00
Western Elec. No. 315 inside connection 3-bar 1000-1600 or 2500 ohm desk set signal sets @	5.35
Western Elec. No. 240 External post connection 3-bar 1000-1600 or 2500 ohm Bdg. hotel set @	5.00
Dean Elec. No. 240 4-bar 1000 or 1600 ohm Bdg. compacts @	6.75
Chicago Tel. Supply Co. 4-bar 1000 or 1600 ohm Bdg. compacts @ $6.75—5-bar @	7.50
Leich Elec. desk set complete with Stromberg 4-bar 1000-1600 or 2500 inside cord connection signal set @	8.75
Western Elec. No. 329 or 323 Transmitters with backs and Mouthpiece @	1.25
Automatic Elec. Receivers with repolished shell and new Cord @	1.00
Leich Elec. No. 7a Ringing machine, operates off 110 volts A. C. Light Ckt. @	20.00
Western Elec. No. 122 External post Receivers less cord @	.65

Write for Bulletins

REBUILT ELECTRIC EQUIPMENT CO.
1940 West 21st Str., Pilsen Station Chicago, Ill.

Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912,

of Telephone Engineer, published monthly at Chicago, Ill., for April 1, 1931.

State of Illinois, County of Cook, ss.—Before me, a notary public in and for the state and county aforesaid, personally appeared J. A. Smith, who, having been duly sworn according to law, deposes and says that he is the business manager of the Telephone Engineer and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher—Telephone Engineer Publishing Company, Chicago, Ill.

Editor—J. A. Smith, Chicago, Ill.

Managing Editor—D. Weiner, Chicago, Ill.

Business Manager—J. A. Smith, Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Telephone Engineer Publishing Co., Chicago, Ill.

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Agnes M. Leffert, Coldwater, Mich.
W. J. Uhl, Logansport, Ind.
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J. A. Smith, Chicago, Ill.
John H. Wright, Jamestown, N. Y.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state.)—W. H. Graffis & Sons, Chicago, Ill.; W. H. Graffis, Star City, Ind.; Herb. Graffis, Chicago, Ill.; Joe Graffis, Chicago, Ill.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

J. A. SMITH,
Business Manager.

Sworn to and subscribed before me this 2nd day of April, 1931.

(Seal) Carl A. Johnson,
Notary Public.

(My commission expires Feb. 21, 1932.)

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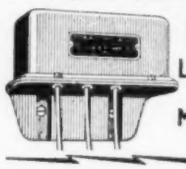
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